Health Consultation

PUBLIC COMMENT RELEASE

Review of Air Quality Data

INTEL CORPORATION – NEW MEXICO FACILITY

RIO RANCHO, SANDOVAL COUNTY, NEW MEXICO

EPA FACILITY ID: NMD000609339

FEBRUARY 2, 2009

COMMENT PERIOD END DATE: APRIL 3, 2009

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

The U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
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Public Health Consultation

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List of Acronyms and Abbreviations

ATSDR	Agency for Toxic Substances and Disease Registry
CAQTF	Corrales Air Quality Task Force
CEWG	Community Environmental Working Group
CRCAW	Corrales Residents for Clean Air and Water
DHHS	Department of Health and Human Services
U.S. EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
Intel-New Mexico	Intel Corporation facility in Rio Rancho, New Mexico
m^3	cubic meters
NM	New Mexico
NMDOH	New Mexico Department of Health
NMED	New Mexico Environment Department
ppb	Parts per billion
ppm	Parts per million
TRI	Toxics Release Inventory
µg	micrograms
VOC	volatile organic compound

Summary

In July 2004, ATSDR received a petition from a community group requesting a determination of whether air emissions from the Intel Corporation facility in Rio Rancho, New Mexico (Intel-New Mexico) might pose a public health concern to community members who lived in communities near the facility. In response to this petition, ATSDR gathered and evaluated an extensive amount of information about the Intel-New Mexico facility and about relevant air sampling and monitoring studies. The conclusions in this document are based on the evidence and data collected over the past few years. Specifically, ATSDR obtained documents and relevant insights from

- Intel Corporation,
- the New Mexico Department of Health (NMDOH),
- the New Mexico Environment Department (NMED),
- the U.S. Environmental Protection Agency (U.S. EPA),
- the Corrales Residents for Clean Air and Water (CRCAW),
- concerned community groups, and
- Individual community members.

The following paragraphs summarize ATSDR's evaluation.

Air emissions. Intel-New Mexico's air permit requires both direct measurements of air emissions from certain facility processes and, through the use of calculations, an estimate of facility-wide emissions. These emissions data were useful for identifying chemicals to evaluate in public health evaluations. However, during the review of this information, ATSDR also identified several opportunities for providing greater confidence in the existing emissions data for Intel-New Mexico, which would also address some community concerns. ATSDR has documented these opportunities in a letter to NMED.

Dispersion modeling information. ATSDR thoroughly reviewed available dispersion modeling information for Intel-New Mexico, focusing particularly on the modeling conducted as part of the Corrales Air Quality Task Force Study. ATSDR found this study useful in some regards, but its inherent uncertainties and limitations such as accuracy of the emission rate inputs and allocation of emissions between different sources prevented ATSDR from basing health conclusions on the modeling estimates alone.

Outdoor air quality. During a span of approximately 10 weeks in 2003 and 2004, Intel-New Mexico and NMED used continuous, open-path FTIR monitoring to measure, adjacent to its facility, the ambient air concentrations of numerous chemicals. Results from these monitoring efforts are not adequate to evaluate fully the potential public health consequences of air emissions from Intel-New Mexico.

A review of peak 1-hour levels of selected chemicals and associated wind patterns suggest that the Intel-New Mexico facility may be the source of some of these chemicals. But the levels of

select compounds measured with sufficient sensitivity and reliability by the open-path FTIR, (e.g., acetone, ammonia, carbon monoxide, isopropyl alcohol, and carbon tetraflouride) were below health-based comparison values and levels of health concern.

During brief periods, the open-path FTIR detected some compounds at levels above their odor thresholds. These included acetaldehyde, benzaldehyde, formaldehyde and n-butyraldehyde. Some of the chemicals intermittently detected by open-path FTIR monitors could be associated with odors reported by the community.

Recommendations. ATSDR recommends several important public health actions for this site, including exploring the possibility of stakeholders conducting additional ambient air monitoring for selected chemicals within the community, conducting physician health education, and encouraging Intel-New Mexico to continue, where feasible, to reduce air emissions from its various facility operations.

The remainder of this health consultation describes how ATSDR reached these conclusions and why ATSDR makes these recommendations. Those interested in only a summary of the conclusions and recommendations will find them at the end of this document, before the appendices. Those interested in how ATSDR evaluated the available data to develop the conclusions are encouraged to read the entire report, which includes a detailed, technical review of site-specific air quality issues.

Statement of Issues

> **What Is a Petition?**
> A petition is a written request from any individual person asking ATSDR to conduct public health assessment activities to evaluate the potential exposure to environmental contaminants released at a hazardous waste site or facility located in their community.

A community group in New Mexico petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) to investigate the Intel Corporation's semiconductor manufacturing facility in Rio Rancho (Intel-New Mexico), Sandoval County, New Mexico (Petitioner's letter 2004).

ATSDR was asked to determine whether air emissions from Intel-New Mexico presented a public health hazard to residents in nearby communities. To address the community's public health concerns, ATSDR developed this health consultation that evaluated available emissions data, dispersion modeling information, and outdoor ambient air monitoring data.

Air Emissions Data. An initial step in preparing this health consultation was to use the concerns expressed to ATSDR by community members to define clearly the scope of the evaluation. Accordingly, listed below are some important decisions about the scope of this document:

- **What time period does this health consultation address?** This health consultation focuses largely on air quality issues dating back to 2000. This period was selected because in recent years, community concerns have increased in response to facility expansions. This period also corresponds to the years for which the most extensive and relevant documentation is available for addressing air quality issues. ATSDR also reviewed and considered information from earlier time periods, as appropriate.
- **Which emission sources does this health consultation consider?** The community health concerns communicated to ATSDR specifically addressed air pollutants released from the Intel-New Mexico facility. This health consultation focuses entirely on Intel-New Mexico's emission sources, particularly those known or suspected to release the greatest amount of air pollutants.
- **Which exposure scenarios does this health consultation consider?** Consistent with the community concerns, this health consultation focuses entirely on outdoor air quality issues potentially related to Intel-New Mexico's air emissions. Occupational exposures that may occur at the Intel-New Mexico facility or exposures to contaminants possibly found in other environmental media are not addressed in this health consultation. However, some occupational epidemiology studies are included in this health consultation for comparison purposes.

After discussing these concerns with the petitioner, residents, and community groups, ATSDR identified the following ***objectives*** for this health consultation.

The Objectives of this Health Consultation

Respond to three specific community concerns regarding air pollutants released from the Intel facility:

- Are the measured air pollution levels near Intel-New Mexico indicative of a public health concern?
- What pollutants does Intel release? Are the estimated and measured emission rates accurate?
- Do the modeling studies provide definitive health conclusions about how Intel-New Mexico's air emissions affect local air quality?

The previous discussion describes important decisions that ATSDR made, based on community concerns, when framing the issues to address in this health consultation. The remainder of this report documents how ATSDR evaluated the specific community concerns.

Background

Site History and Operations

Intel-New Mexico is located at 4100 Sara Road, Rio Rancho, New Mexico, approximately 15 miles north of Albuquerque. The Rio Grande River flows from north to south in the region. Intel-New Mexico is located on a mesa to the west of the Rio Grande, near commercial and residential areas, and between the City of Rio Rancho and Village of Corrales. With approximately 3,300 workers, Intel-New Mexico is the largest private industrial employer in New Mexico.

Intel Corporation began New Mexico operations in 1980. In the early years, most production occurred in two fabrication lines (also known as "fabs"): Fab 7 and Fab 9. These fabrication lines produced wafers and flash memory (used in memory card and flash drives), but currently these lines are no longer in operation. Intel-New Mexico's current operations take place largely in Fab 11 and Fab 11X. The Intel-New Mexico campus presently includes more than four million square feet of manufacturing facilities and office space (Intel Corp 2008). In Fab 11X, Intel-New Mexico manufactures 12-inch (300 mm) wafers 24 hours a day, 7 days a week. In Fab 11, from 1993 through August, 2007 the facility manufactured 8-inch silicon wafers— in the second half of 2008 this fab began producing the facility's next generation processors.

Like other semiconductor manufacturers, Intel-New Mexico's production processes have changed considerably over the years. Some changes were made to accommodate changing production demands, some were to comply with environmental regulations, and still others were to keep up with scientific and technological advances in the field of microelectronics. The evolving nature of this facility is an important factor to consider when evaluating the facility's air emissions. With frequent alterations in, among other things, production rates, chemical usage, and pollution control equipment, air emissions observed at any point in time might differ from those observed over the long term.

Throughout its production processes, Intel-New Mexico uses many chemicals. Every day large quantities of volatile organic compounds (VOCs), acids, and various inorganic compounds flow through Intel's production facilities. Many of these chemicals are not incorporated into a finished semiconductor product. They are part of the production processes, and are either

- consumed in chemical reactions,
- captured in air pollution control devices,
- collected as hazardous or non-hazardous waste,
- emitted from pollution control devices into the air, or
- released in wastewater[1].

This health consultation, as requested in the petition, focused on Intel-New Mexico's air emissions.

In that regard, the first point to consider is that Intel-New Mexico air emissions originate from many sources. Fabrication lines, boilers, emergency generators, cooling towers, and tanks can all add chemicals to the air. In fact, Intel-New Mexico is required to report to the New Mexico Environment Department (NMED) the amounts of chemicals it uses—the reported information assists in estimation of air emission rates. Still, most "clean room" air exhaust from Intel-New Mexico's fabrication areas is continuously vented through air pollution control devices before entering the atmosphere. Intel-New Mexico's air permit requires venting through thermal oxidizers air exhaust streams containing VOCs, and venting through scrubbers exhaust streams containing inorganic pollutants. Since operations startup at Intel-New Mexico, scrubbers have removed acid aerosols and ammonia (F. Gallegos, Intel Corp., email to P. Kowalski, ATSDR, January 15, 2008). And in 1994, Intel-New Mexico installed rotary concentrator thermal oxidizers (RCTOs) to reduce process emissions generated by manufacturing and ancillary operations.

1" Intel has a wastewater discharge permit to a WWTP" (wastewater treatment plant) "on adjoining property…Unless wastewater containing the chemicals mentioned above, are impounded on Intel property, transported to another site, or otherwise disposed of, they are generally not released in wastewater to the WWTP without pretreatment…" (EPA 2009)

Air Permit History

NMED is the authority responsible for issuing and enforcing Intel's facility-wide air permit. Intel-New Mexico submitted its first permit application on July 31, 1980, and NMED issued the facility's first permit (No. 325) on October 21, 1980. Source operations began in 1982 with only one fabrication line ("Fab 7"). In the years since, Intel-New Mexico has submitted several applications for process modifications and facility expansions. Table 1(on the following page) provides a chronology of Intel-New Mexico's air permit history from October 21, 1980 through December 1, 2008, noting reasons for various modifications and revisions.

In general, the permit changes accommodated upgrades at the facility and reflected newly acquired information. While Intel-New Mexico changed its operations numerous times, the facility's major expansions are listed below (and process modifications continue to occur).

- The first major facility expansion was in the 1980s and consisted of the construction of Fabs 9.1 and 9.2. The permit for this construction was issued in 1984 (permit 325-M-1). Fabs 9.3 and 9.4 were also included in this permit, but Fab 9.3 was not constructed until the 1990s, and Fab 9.4 was never constructed.
- The second major facility expansion in the early 1990s was authorized through multiple permit revisions (i.e., 325-M-3 through 325-M-6). In this expansion, Intel-New Mexico eliminated the plan for Fab 9.4 but increased the capacity of Fabs 9.2 and 9.3.
- The third major facility expansion occurred in the middle 1990s. This expansion added Fab 11, Fab EP2, and several large boilers. This expansion was approved under several permit revisions (i.e., 325-M-6 through 325-M-9). In addition to doubling the size of the facility, Intel-New Mexico renamed Fab 9.3 to Fab 11 EP1 and added several generators, boilers, and air pollution control devices.

Some of the more recent permit revisions (i.e., 325-M-9 R10 through 325-M-9 R18) were either administrative in nature or added emissions limits and other requirements to keep Intel-New Mexico within federal environmental "synthetic minor" policies and guidance. "Synthetic minor" refers to facilities that accept permit conditions limiting emissions below thresholds that would, if exceeded, designate the facility as a "major source."

Table 1. Intel-New Mexico's Air Permit History

Permit Number	Date Permit Issued	Selected Reasons for Permit
325	October 21, 1980	Permit for original construction (Fab 7)
325-M-1	August 17, 1984	Expansion to add Fab 9.1, 9.2, 9.3, and 9.4
325-M-2	February 21, 1986	Increased VOC emission limits
325-M-3	February 27, 1991	Upgraded boilers and increased VOC limits
325-M-4	July 5, 1991	Removed Fab 9.4 from the plan
325-M-5	May 29, 1992	Reconfigured scrubber exhaust
325-M-6	December 4, 1992	Added new fabrication line and boilers
325-M-7	August 11, 1994	Added a RCTO and changed boilers
325-M-8	January 17, 1995	Installed another RCTO
325-M-8 R1	February 5, 1997	Added new controls and agreed to stack testing
325-M-9	March 3, 2000	Sets limits for a "synthetic minor" source
325-M-9 R1	September 25, 2000	Added an additional emergency generator
325-M-9 R2	December 14, 2000	Re-designated two acid gas scrubbers
325-M-9 R3	December 14, 2000	Relocated two acid gas scrubbers
325-M-9 R4	March 6, 2001	Updated emission factors for boilers
325-M-9 R5	May 7, 2001	Added four emergency generators
325-M-9 R6	September 26, 2001	Relocated and installed scrubbers and an RCTO
325-M-9 R7	March 12, 2002	Updated emission factors for the boilers
325-M-9 R8	September 6, 2002	Updated emission factors for various sources
325-M-9 R9	March 12, 2003	Updated emission factors for the boilers
325-M-9 R10	April 22, 2003	Corrected two typographical errors in the permit
325-M-9 R11	April 13, 2004	Updated emission factors for the boilers
325-M-9 R12	April 13, 2004	Updated emission factors for RCTOs and scrubbers
325-M-9 R13	April 13, 2006	Updated emission factors for several sources
325-M-9 R14	April 17, 2007	Updated emission factors for several sources
325-M-9 R15	January 8, 2008	Revisions to reflect installation of new RCTOs
325-M-9 R16	April 18, 2008	Updated emission factors (e.g., for RCTOs, boilers)
325-M-9 R17	September 12, 2008	Correction to typographical error in earlier permit
325-M-9 R18	November 21, 2008	Revision to reflect removal of retired boilers

Notes: NMED assigned the Intel-New Mexico facility Permit Number 325. Permit modifications are designated by different "M" numbers, and permit revisions by different "R" numbers.

Permit modifications and revisions are typically issued for multiple reasons. The table lists some, but not all, of the reasons that updated permits were issued.

The table lists permit revisions and modifications issued as of December 1, 2008.

Intel's technical permit revision submitted to NMED in December 2008 is not listed in the Table since a permit was not issued before December 1, 2008 .

Demographics

The 2000 U.S. Census reported 89,908 persons living in Sandoval County. Within that population, 7.3% were under 5 years of age; 82.1% between 5 and 64 years, and 10.6% were 65 years and older (Bureau of the Census 2008a). In 2000, the City of Rio Rancho had an estimated population of 51,765, comprising approximately 18,995 households (Bureau of the Census 2008b). The U.S. Census estimates that Rio Rancho's 2006 population is 72,626, a 40 percent increase from 2000 (Bureau of the Census 2008b). As shown in Figure 1, an estimated 12,011 persons live within 1 mile of the site; additional demographic statistics are also listed in Figure 1.

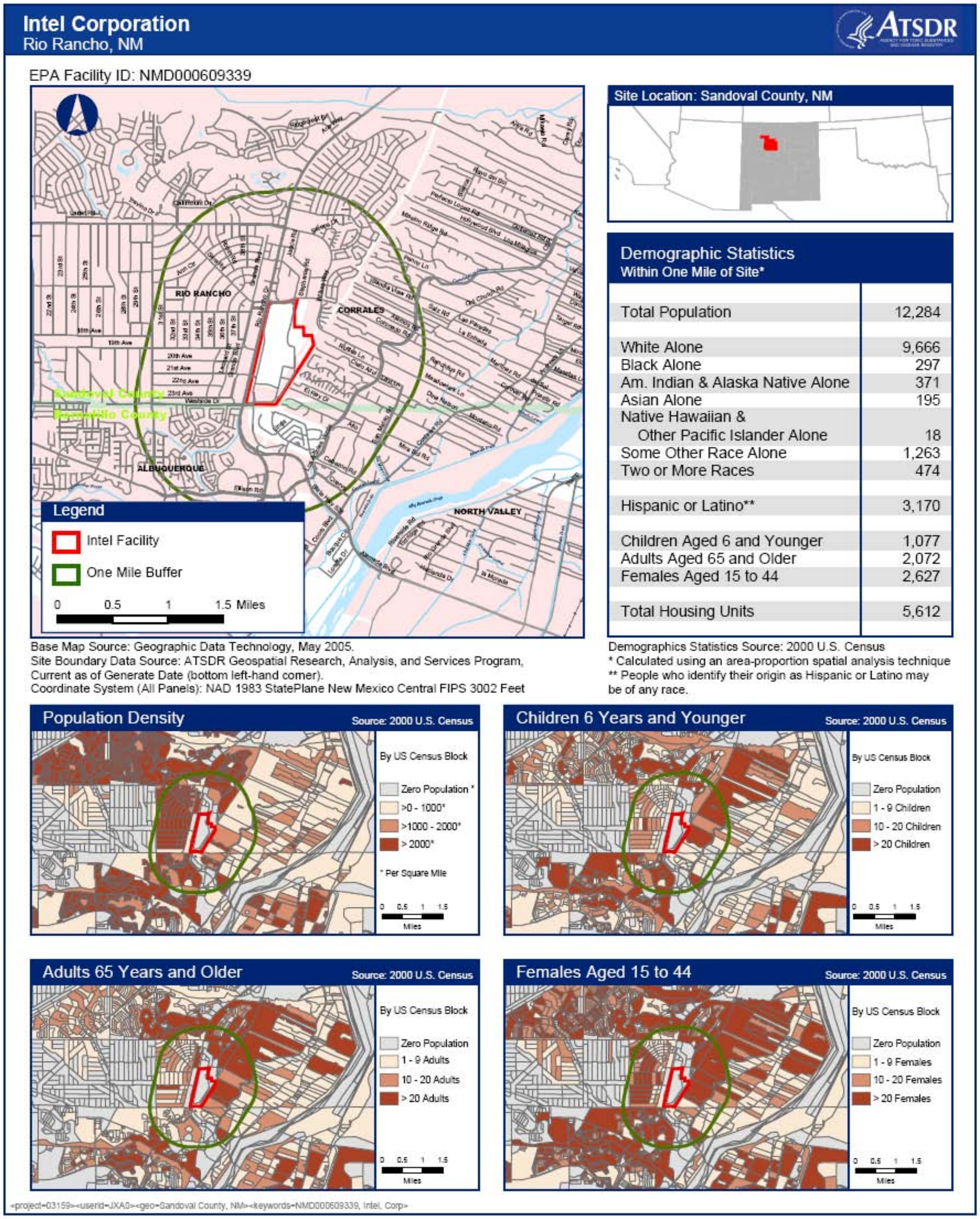
Community Health Concerns

Corrales and Rio Rancho surround Intel-New Mexico. Residents have reported many physical symptoms they believe are associated with air emissions from the facility. As stated in the petition letter, some residents were fearful for themselves and their families, and others have even moved out of the area to seek refuge from chemical exposures (Petition letter 2004). Some symptoms residents reported included, but were not limited to, headache, cough, migraine, irritability, inability to breathe, seizures, throat irritation, eye irritation, nausea, vomiting and dizziness. Community members also complained about strong odors of burnt coffee, acid, perfume, burnt wood, and vinegar. See Appendix A for a more complete listing of community concerns, together with ATSDR's responses to these concerns.

In 2002, the SouthWest Organizing Project, a regional environmental and community group, in collaboration with Oregon-based River Networks, conducted a symptom and prevalence survey in the area. These organizations have not released a formal report on their efforts. But the Corrales *Comment,* a local newspaper, after interviews with the representatives of the organizations that conducted the survey, reported that residents living closer to Intel-New Mexico were more likely to report symptoms of persistent cough, frequent headaches, sore throats, and allergy-like symptoms (Radford 2005).

Some community members were particularly concerned about how much protection the Intel-New Mexico air permit afforded them, and how thoroughly the NMED enforced the permit's limits. NMED administers the air permit under authority delegated by the U.S. Environmental Protection Agency. Residents concerned about the effectiveness of the permit should contact these agencies since ATSDR does not have the legal authority to resolve regulatory issues.

Figure 1. Site Demographic Map



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Corrales Air Quality Task Force

At various times in the 1990s, citizens submitted complaints to NMED about health problems that they considered attributable to air pollution from Intel-New Mexico. The Mayor of Corrales compiled these complaints and presented them to NMED. To help investigate and address these concerns, in October 2002, NMED's Air Quality Bureau applied for and received a grant from U.S. EPA Region 6 to establish the Corrales Air Quality Task Force (CAQTF) and to investigate air pollution levels in and near Corrales and Rio Rancho.

In November 2002, NMED formed the CAQTF to provide NMED with input and comments on a range of issues related to the U.S. EPA-funded air quality study. Active from December 2002 until June 2004, the CAQTF also investigated Corrales-area citizens' health concerns that could be related to toxic air pollution in the area. Through the CAQTF, NMED's Air Quality Bureau conducted a series of meetings with Corrales citizens to address their complaints. Citizens communicated their various health complaints at monthly meetings, and their suggestions were instrumental in designing and implementing an ambient air monitoring program (NMED 2004a).

The Corrales Air Quality Study had five key objectives:

1. Identify potential hot spots and specific air toxics of concern in the area.
2. Develop an emissions inventory for the area.
3. Perform an air dispersion modeling analysis.
4. Perform an ambient air monitoring study to characterize exposure levels.
5. Characterize toxicological risk considering the monitoring and modeling results and dose-response assessment

   (NMED 2004b).

The study culminated with NMED releasing a toxicological risk characterization. The report, "Human Health Risk Characterization, Corrales Environmental Health Air Quality Evaluation," was prepared by Gradient Corporation, an environmental consulting firm working under contract to NMED. The primary goal of the Corrales Environmental Health Air Quality Evaluation was to assess the potential for acute health impacts associated with measured and modeled concentrations of chemicals in outdoor air. In that regard, the report estimated whether adverse health outcomes could be associated with exposure to air pollution in the Village of Corrales. Yet the human health risk characterization was just one component of the report—chronic health risks were also evaluated. To evaluate those risks only the air modeling estimates were used since the available air monitoring data were not representative of long-term air concentrations. The risk assessment concluded that the measured and modeled exposure concentrations of the chemicals of interest were not associated with increased acute or chronic health risks. The report also noted however, that the health complaints of Corrales citizens might be related to local pollutant emission sources:

> . . . this risk assessment did not find evidence that any of the measured or modeled chemicals are associated with increased acute or chronic health risks…it still remains possible that the health complaints of Corrales citizens are related to local pollutant emission sources. However, this assessment did not find sufficiently elevated concentrations of a particular compound such that adverse health effects would be expected.

(Gradient 2004)

Other Efforts to Address Community Health Concerns

In addition to the Corrales Air Quality Study, in October 2001 the Mayor of Corrales requested that NMED conduct a health risk assessment for the Village of Corrales. NMED's Air Quality Bureau proposed a stakeholder-based health risk assessment process to develop a plan to research, identify, and quantify potential air quality health risks from toxic air pollutants in the Village of Corrales. From April 2003 to May 2004, NMED collected information regarding health and odor complaints from residents of Corrales, Rio Rancho, and Albuquerque. A total of 266 reports were received during this time period. Two persons submitted 54% of the total reports and five persons submitted 79% of the total reports. The reported health symptoms and odor descriptors were diverse (NMED 2004c). Using the emissions inventories, monitoring and modeling data, and the odor complaint information, NMED's health risk assessment concluded that the evidence did not support a hypothesis that any of the modeled or measured chemicals were associated with increased acute or chronic health risks (NMED 2004c). NMED noted, however, that uncertainties adversely affected the admittedly limited amount of available monitoring and modeling data (NMED 2004c).

In November 2003, Intel-New Mexico established a process to address community concerns: a "Community Information" line to provide information about operations and associated emissions. In 2004, Intel-New Mexico also established the Community Environmental Working Group (CEWG) to provide a community process for addressing environmental, health, and safety issues. The CEWG is chaired by Mr. John Bartlit, who also serves as chair for the New Mexico Citizens for Clean Air and Water. CEWG meeting minutes are posted at: http://www.intel.com/community/newmexico/cewg.htm (Intel Corp 2008).

Pathway Analysis

A critical element of this health consultation is *exposure*, or how humans come into contact with air pollutants. Analyzing exposure is important: if residents are not exposed to air pollutants, then the pollutants cannot pose a public health hazard and additional analyses are not necessary. If residents are exposed, then further analysis is needed to evaluate the exposure. Even if an exposure has occurred, that does not mean the exposed residents will have adverse health effects or get sick. In cases where exposures have occurred, ATSDR considers several questions when determining if adverse health effects could occur:

- To what pollutants are people exposed?

- How often are people exposed, and for how long?

- What are the pollution levels to which people are exposed?

When evaluating sites with outdoor air quality issues, ATSDR needs information on air pollution levels and how these levels change with location and time. ATSDR uses various approaches to evaluate air pollution. The preferred approach is to review air sampling data, or direct measurements of pollutants in the air that people breathe. However, for most sites that ATSDR evaluates, air sampling data are not available for the entire range of pollutants, locations, and time frames of interest. In these cases, ATSDR uses other approaches to evaluate potential exposures. These approaches include reviewing air emissions data, dispersion modeling information, and outdoor air quality data (see below).

Environmental Data

ATSDR evaluates contaminants detected in environmental media at hazardous waste sites or facilities and determines whether an exposure to those contaminants has public health significance. This section documents the environmental data that ATSDR reviewed, which included air emissions data (or the amount of chemicals that Intel-New Mexico releases into the air), dispersion modeling information, and outdoor air quality data. These three datasets were chosen because they paralleled the specific objectives of this health consultation.

ATSDR's evaluation of environmental data for the air exposure pathway focused on whether airborne levels of contaminants were above health-based comparison values. Health-based comparison values are specific concentrations of chemicals determined unlikely to result in adverse health effects. It is important to note that comparison values are not thresholds of toxicity; exceeding a comparison value does not by that fact alone result in an adverse health effect (see text box).

Once the environmental data have been obtained and evaluated, ATSDR scientists determine whether people are exposed to the contaminants. Appendix B contains specific information on ATSDR's methodology, and health-based comparison values are described in Appendix C.

What Are Health-Based Comparison Values?

To interpret air pollution measurements, this health consultation uses a screening process to identify the pollutants of potential health concern that warrant more detailed evaluation. In this screening process, measured air pollution levels are compared with "health-based comparison values." These comparison values are developed from the scientific literature concerning exposure and health effects. To be protective of human health, most comparison values have safety factors built into them. In other words, these comparison values are intentionally selected to be lower than the lowest air pollution levels known to be associated with adverse health effects, considering an ample margin of safety.

As a result, air pollution levels *lower* than their corresponding health-based comparison values are generally considered to be safe and not expected to cause harmful health effects. But the opposite is not true: air pollution levels *greater* than comparison values are not necessarily harmful. Rather, pollutants found at levels above comparison values require a more detailed evaluation, considering the duration of exposure, demographics, and other factors. In short, ATSDR uses health-based comparison values to focus its evaluations on the pollutants of greatest health concern for a given site.

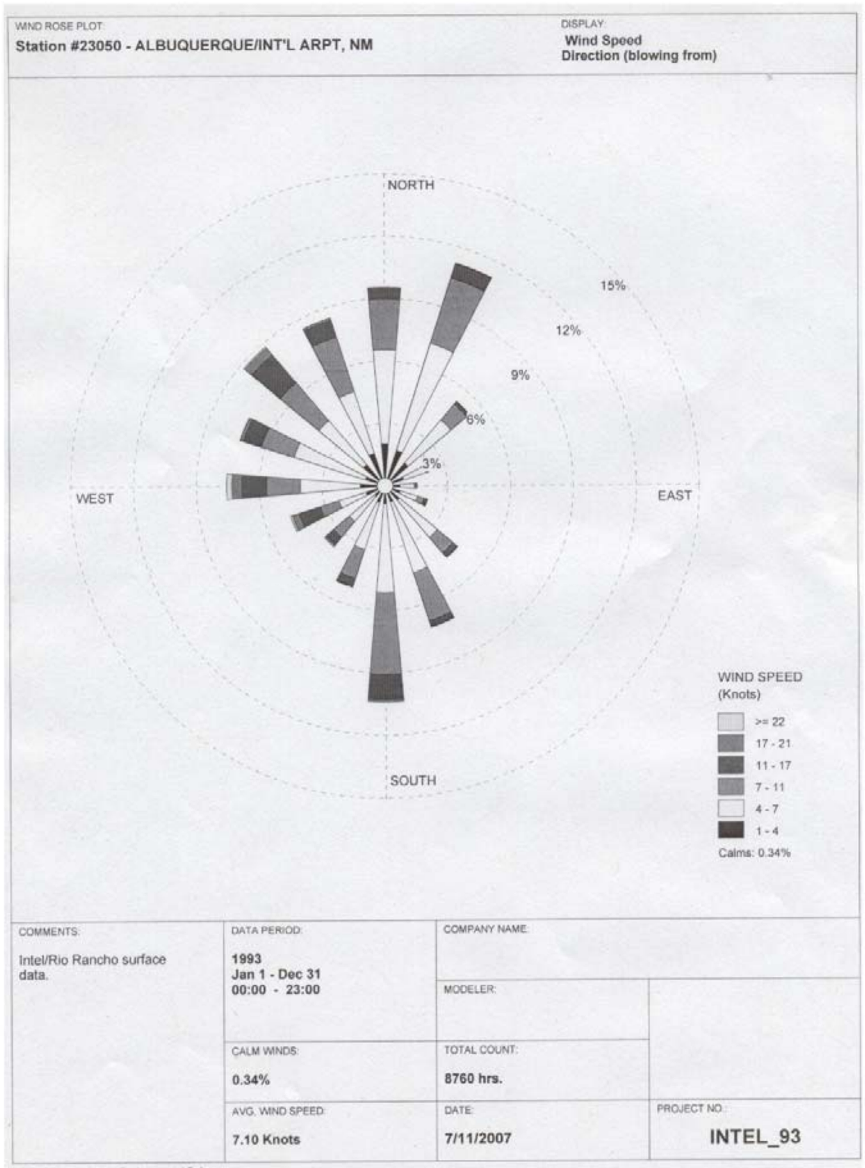
Climate and Meteorology

Local climate and meteorology can affect how air pollutants move from a source to downwind locations. Like almost everywhere else, weather conditions near the Intel-New Mexico facility vary from one season to the next. According to 30 recent years of weather observations made in Albuquerque, the monthly average temperature in the area ranges from 35.7 degrees Fahrenheit (^{o}F) in January to 78.5 ^{o}F in July. The area typically receives less than 10 inches of precipitation per year, mostly in the form of rain (NCDC 2002).

Several factors influence prevailing wind patterns near the Intel-New Mexico facility. Weather fronts, local terrain features, and seasonal and diurnal effects can all affect wind direction, duration, and velocity. Nearest the Intel-New Mexico facility, winds have been observed blowing in all directions. Nighttime winds are typically light and blow from northerly to southerly directions. By contrast, daytime winds are stronger and blow from southerly to northerly directions. Other site reports document detailed evaluations of local meteorological conditions (Koracin and Watson 2003) (ERM, 2005).

Summarized in Figure 2—in a format known as a wind rose— are wind speed and wind direction measurements collected at the Albuquerque International Airport in 1993(NMED, 2007). A wind rose displays the statistical distribution of wind speeds and wind directions observed at a particular location. NMED prepared the wind roses for the purpose of modeling how emissions move through the air near the Intel-New Mexico facility. By design, the wind rose summarizes wind measurements over a single year, though this presentation style does not depict changes in wind patterns that occur from one year to the next, seasonally, and between day and night.

Figure 2. Wind Rose Developed from Surface Data Collected at Intel-New Mexico



Source: NMED 2007.

Air Emissions Data

Air emissions data—or information on the amount of pollutants that a facility releases into the air—help provide insight on how that facility might affect air quality and whether exposures are of potential health concern.

Air emissions are typically characterized by direct measurement (or source testing) or by estimation. Examples of estimation include mass balances, application of air emission factors, and engineering calculations. Intel-New Mexico's emissions were characterized using both direct measurement and estimation, and both are reviewed below.

Air emissions data main finding: Intel-New Mexico's air permit requires both direct measurement of air emissions from certain facility processes and, using calculations, estimation of facility-wide emissions. These emissions data are useful for identifying chemicals to evaluate in public health evaluations. Several opportunities are available to gather additional data that could increase confidence in the emissions data. This would help address community concerns expressed to ATSDR on this matter. ATSDR has corresponded with NMED, describing in greater detail opportunities for gathering additional insight into the Intel facility emissions.

ATSDR considered that emissions data responded to community concerns specific to the reported emissions rates. ATSDR therefore addressed questions regarding dispersion modeling studies, which use emission rates as inputs (see Dispersion Modeling Information). But researchers cannot typically base public health conclusions on emissions data alone—residents are almost never exposed directly to pollutants emitted from a facility's stacks. Rather, a facility's emissions first move through and disperse into the air, where they often mix with emissions from other sources, before they reach locations where residents might be exposed.

When evaluating emissions data, researchers must consider any differences or changes in a facility's production processes. For instance, Intel-New Mexico's production levels, unit operations, and chemical usage change considerably over time. Thus, site-specific emissions data from one time period are not necessarily representative of other periods. Similarly, measured emission rates for Intel-New Mexico can vary considerably from hour to hour within a day. Consequently, when responding to community health concerns and when interpreting relevant measurements for this site, temporal variations should be considered.

To understand the nature and magnitude of air emissions from Intel-New Mexico, ATSDR thoroughly reviewed numerous emissions inventories, testing reports, permit applications, and other documents. ATSDR conducted this review primarily to inform the evaluation of dispersion modeling information and outdoor air quality data (reviewed later in this section). However, during the review of this information, ATSDR also identified several opportunities for providing greater confidence in the existing emissions data for Intel-New Mexico, which would also address some community concerns. ATSDR has documented these opportunities in a letter to NMED.

Dispersion Modeling Information

> **Main finding on dispersion modeling information:** ATSDR thoroughly reviewed available dispersion modeling information for Intel-New Mexico, focusing particularly on recent modeling conducted as part of the Corrales Air Quality Task Force Study. ATSDR found that this study has findings that in some regards are useful, but it also has inherent uncertainties and limitations that prevent the agency from basing health conclusions on the study's modeling estimates alone.

Dispersion modeling studies offer a means for *estimating* a facility's air quality effects, based on inputs that characterize pollutant-specific emission rates and local meteorological data. These studies are widely used: they can provide insight on air quality effects for many locations and averaging times, without the expense of conducting extensive ambient air monitoring. However, when conducting dispersion modeling studies, and especially when representing facility configurations, principal investigators must make numerous assumptions. These assumptions can have significant bearing on the modeling results. The greatest limitation of these studies is that they can only *estimate* air quality impacts based on current scientific understanding of how pollutants move through the air. The accuracy of model predictions depends on both the quality of model inputs and how accurately a model reflects actual atmospheric and topographic conditions. Thus, to thoroughly review modeling studies is critical, especially to determine whether their predictions should be used in public health evaluations.

Numerous atmospheric dispersion modeling studies have been conducted for the Intel-New Mexico facility. Some of these studies were conducted to support human health risk assessment, while others were to support permit applications. ATSDR conducted detailed reviews of multiple studies; this section reviews the findings from the dispersion modeling conducted by two independent researchers as part of the Corrales Air Quality Task Force Study. Funded by both U.S. EPA and NMED, this study arguably represents the most widely publicized effort to-date to address community concerns regarding how Intel-New Mexico has affected air quality.

NMED sponsored the Corrales Air Quality Task Force Study "to identify and analyze potential air quality health risks due to toxic air pollution in the Village of Corrales" (NMED 2004c). This study involved several separate tasks, such as emission inventory development, air dispersion modeling, and ambient air monitoring—all conducted to provide input to a human health risk assessment. Different contractors supported NMED on these tasks, with scientists from Desert Research Institute and Worldwide Environmental Corporation serving as the principal investigators for the dispersion modeling study (Koracin and Watson 2003). This modeling study was a high-visibility project: through a series of public meetings, local residents actively participated, and the eventual results were widely publicized.

In this study, CALPUFF[2] modeling system was used for the dispersion modeling—an appropriate model selection for the intended application. The CALPUFF simulations estimated air quality impacts of 10 organic pollutants emitted from Intel-New Mexico's RCTOs and 17 inorganic

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2 A non-steady-state puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation, and removal. CALPUFF can be applied for long-range transport and for complex terrain. See http://www.epa.gov/scram001/dispersion_prefrec.htm.

pollutants emitted from Intel-New Mexico's scrubbers. According to the final modeling report, NMED provided the principal investigators all emissions data for use as model inputs. The modeling inputs are reasonably consistent with emission rates documented in Intel-New Mexico's quarterly reports from 2002.

The modeling analysis included a thorough evaluation of local meteorology, making good use of all available datasets. The meteorological modeling domain for this evaluation was larger than that considered in other modeling efforts and was inclusive of actual observations. The description of the meteorological modeling approach and results appear reasonable and consistent with standard modeling practice.

In this particular study, some assumptions were made such as aggregating emissions from multiple sources into single sources, not fully considering building downwash and wake effects, and estimating concentrations at a handful of discrete receptors (rather than using a receptor grid). Exactly how these assumptions affected the modeling results is not easily quantified, without replicating the entire study using different approaches.

Overall, the Corrales Air Quality Task Force Study modeling provided useful insights into the meteorological conditions around Intel-New Mexico. It also predicted outdoor air pollution levels for several pollutants, but these estimated levels have inherent uncertainties and limitations that prevent ATSDR from basing health conclusions on these modeling estimates alone. For example, the accuracy of the modeling results depends on the accuracy of the emission rate inputs: any positive or negative biases in the emission rate inputs propagate through the dispersion models and into the modeling results. Additionally, assumptions made when running the model (such as how to allocate emissions between different sources) can affect the modeling results. These inputs and assumptions impact the model's output, i.e. actual air pollution levels may have been lower or higher than the model predictions. Thus, rather than basing important health conclusions on these estimates, ATSDR placed a greater emphasis on reviewing outdoor air quality measurements collected near Intel-New Mexico, as reviewed in the next section. Additional ambient air monitoring could provide needed information to more fully evaluate possible community exposures to several pollutants as discussed in the next section.

Outdoor Air Quality

For this health consultation, ATSDR reviewed outdoor air quality data (also referred to as "ambient air monitoring data" or "air sampling data") collected by several parties. The most extensive data were collected as part of the following two studies, though ATSDR considered additional data sources as well:

- Outdoor air monitoring data collected by NMED and Intel-New Mexico contractors in 2003 and 2004, using open path Fourier-Transform Infrared (FTIR) spectrophotometers. Appendix D contains more detailed information on the underlying science of open path FTIR measurement and its associated strengths and limitations.

- Outdoor air samples collected by NMED in residential areas near Intel-New Mexico in 2002 and 2003. These samples were analyzed in a laboratory for volatile organic compounds (VOCs).

NMED and Intel-New Mexico performed extensive monitoring and sampling as voluntary efforts to address community concerns about local air quality. Input from the CAQTF was considered in the design and implementation of these studies. Both NMED's and Intel-New Mexico's monitoring evaluated the potential effect of the facility's air emissions, but was not intended as a full-scale exposure assessment.

Intel New Mexico - Open Path FTIR Data

ATSDR reviewed the following open path FTIR datasets collected by Intel-New Mexico contractors:

Organization/Data Name	Dates	Location
(1) Intel - NW South	Aug 1- 8, 2003	Intersection of 528 and Sara Road (south orientation)
(2) Intel - NW East	Aug 12 - 21, 2003	Intersection of 528 and Sara Road (east orientation)
(3) Intel – South East property line	Aug 21 - Sept 7, 2003	Southeast property line
(4) Intel – "Mariquita" Lane *(not shown in Appendix E)*	Feb 16 – 21, 2004	517 to 625 Mariquita Lane, Corrales (2 miles east of the facility)
(5) Intel - CUB	Feb 24 - March 13, 2004	East property line near the Central Utilities Building

The open path FTIR monitoring procedures employed by Intel-New Mexico are described in detail in their consultants' reports (TRC 2003). Intel-New Mexico's open path FTIR monitor was stationed at five locations: monitoring was conducted at three locations over a 5-week period in the summer of 2003, and additional monitoring was conducted at two locations over 4-week period in the winter of 2004. ATSDR received Intel-New Mexico monitoring data (results) both in spreadsheet format (70-second increments) and in summary reports.

Intel-New Mexico also operated a meteorological station at the open path FTIR locations to measure prevailing wind patterns and other parameters. Additional meteorological monitoring occurred at Intel-New Mexico's permanent station located at the southern portion of its property.

Appendix E shows the open path FTIR monitoring location, except for the Mariquita Lane monitoring location, approximately 2 miles east of Intel-New Mexico.

NMED Open Path FTIR Data

NMED's contractor operated an open path FTIR at two locations over a 5-week period in the summer of 2003. ATSDR received NMED monitoring data in summary reports.

NMED – "Corrales"	July 29 - Aug 24 2003	SE of plant ("Corrales")
NMED – 'NW"	Aug 25 - Sept 2, 2003	Intersection of 528 and Sara Road

NMED Canister Sampling for Volatile Organic Compounds

Evacuated canister sampling was conducted in 2002 and 2003 to measure VOC ambient air concentrations. Detailed results of these data are contained in NMED's Corrales Project Monitoring Data Report (NMED 2004b) Samples were collected and analyzed according to a method developed and published by U.S. EPA. Sampling results follow.

- Between December 26, 2002, and January 13, 2003, NMED collected eight 24-hour canisters samples in the community analyzed for VOCs. Several VOCs were detected in these samples, but all of the measured concentrations were lower than health-based comparison values. The highest concentration of a VOC measured from these samples was 2.2 parts per billion of Freon 11, in a sample collected on January 13, 2003.
- Citizens collected nine 15-second grab samples between June 17, 2003, and August 8, 2003. The samples were collected during times when residents detected foul odors. Some VOCs were detected in these samples, but all measured concentrations were lower than health-based comparison values. The highest concentration of a VOC measured from these samples was 0.9 parts per billion of total xylene in a sample collected on August 8, 2003. Grab samples are designed to quantify the presence of VOCs during a particular brief period (e.g., during the presence of transient odors). Due to their very limited sampling durations, one-time grab samples cannot estimate short-term exposure.
- NMED collected four 1-hour canisters samples for VOCs analyses in the community between August 5, 2002, and August 29, 2003. Several VOCs were detected in these four samples, but all detections were lower than health-based comparison values. The highest concentration of a VOC measured in these four samples was 11.1 parts per billion of toluene, in the sample collected on August 11, 2003.

Community Air Monitoring Data

In 2003, the Corrales Residents for Clean Air and Water (CRCAW) obtained and set up an open path FTIR for monitoring air contaminants in the neighborhood immediately southeast of the plant. As of the date of this health consultation, data from CRCAW's open path FTIR monitoring had not been publicly released.

Quality Assurance and Quality Control

When standardized methods are used, ATSDR typically relies on the information provided in the referenced documents and assumes that adequate quality assurance and quality control measures were followed with regard to chain-of-custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions drawn for this health consultation is determined by the comprehensive and reliable nature of the referenced information.

Intel-New Mexico and NMED reported collecting open path FTIR data in accordance with U.S. EPA Method TO16 (USEPA 1999), which calls for specific statistical methods to interpret measurement results. This method also allows additional analysis of the spectra by trained spectroscopists. Nevertheless, despite the availability of this published method, no single standardized method exists to analyze open path FTIR data (ATSM 2007); thus, different statistical methods are often used to interpret data. As evidence of this, Intel-New Mexico's FTIR data are based on statistical analyses using least-squares methods, whereas NMED's FTIR data are based on statistical "goodness of fit" analyses and supplemental spectral analyses. ATSDR has made the following observations about the open path FTIR data collected at Intel-New Mexico in 2003 and 2004:

- Detection limits varied widely for many chemicals. This suggests that environmental conditions (e.g., water vapor, compounds with similar peaks, or beam misalignment) affected the ability of instruments to identify and quantify ambient air concentrations. ATSDR considered as unreliable any data for compounds with high detection-limit variability.
- A majority of compounds were detected infrequently. This is less than ideal, considering, for most compounds, the variability in detection limits over time.
- The detection limits for chemicals of interest often exceeded their corresponding health-based comparison values. Thus because ambient air concentrations were not quantified in the range of potential interest, this limitation greatly hindered ATSDR's ability to evaluate potential exposures.
- Due to the local topography, fence line monitoring may not represent community exposure. Because of the close proximity of the plant to the residential area and because of the higher elevation of the plant relative to the residential area, fence line monitoring may underestimate exposure to residents living next to the plant's eastern border.

- Six chemicals—carbonyl fluoride, hydrofluoric acid, silane, propylene glycol monomethyl ether acetate (PGMEA), phosgene, and methyl methacrylate—were initially detected, albeit infrequently, by NMED when using the "goodness of fit" statistical analysis. Later, however, NMED classified these chemicals as false positives, based on the spectral analyses of data subsequently conducted by NMED's consultants (NMED 2004b). ATSDR did not attempt to reevaluate the false positive determination by the spectroscopists. Ideally, the monitoring plan would describe in advance how data would be handled, particularly in cases when different statistical analyses reveal different results. But in NMED's monitoring plan, such a possibility was not raised.
- Simultaneous upwind and downwind FTIR monitoring occurred. During some periods, Intel-New Mexico operated its FTIR monitoring device on one side of the facility, while NMED operated its FTIR monitoring on the other side of the facility. Comparing these data should be viewed with caution: the upwind and downwind monitoring occurred using different monitoring equipment, software, and methods of analyses.

Because of the limitations inherent in the FTIR analyses and the site-specific ways in which the data were collected, ATSDR cannot fully rely on these open-path FTIR data to make conclusive public health determinations. Nevertheless, the open path FTIR datasets contain valuable information about air quality during the monitoring periods.

Discussion

ATSDR elected to focus its evaluation on Intel-New Mexico's open-path FTIR datasets because of their methods of documentation and the completeness of their reporting. Table 2 summarizes Intel-New Mexico's open path FTIR data sets. The following information includes chemical detected, percent of the time the chemicals were detected, the average detection limit of the datasets, relative average concentrations (assuming nondetects were zero), mean concentration (excluding nondetections), maximum 1-hour and 24-hour levels, and health-based comparison values.

Main finding on Intel-New Mexico open path FTIR datasets: During a span of approximately 10 weeks in 2003 and 2004, Intel-New Mexico and NMED used continuous, open-path FTIR monitoring to measure, adjacent to its facility, the ambient air concentrations of numerous chemicals. Results from these monitoring efforts are not adequate to evaluate fully the potential public health consequences of air emissions from Intel-New Mexico. The primary limitation of the technology is its inability to measure low levels of multiple air contaminants over time. Consequently, the detection limits for many contaminants often exceeded the health-based comparison values; in other words, the measurement method was not sensitive enough to measure ambient air concentrations at levels ATSDR typically considers in its health evaluations. As a result, ATSDR cannot fully evaluate potential exposure to nearby residents, nor can ATSDR address the potential health impact of chemical mixtures.

Table 2 – N Intel New Mexico Open Path FT-IR Summary (2003 – 2004)									
Chemical	Total Number of Detections/ Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset #)	CV (ug/m^3)	Comparison Value Source	Notes
Acetaldehyde	5858 / 73,008	8	14.58 – 56.77	7.3	91	1465/182.5 (1)	0.5 0.81 90	ATSDR CREG EPA Reg 3 - RBC TX ESL (ST) – odor	1
Acetone	306/72575	0.42	34.56 - 95.93	0.274	65	42.29/ 5.678 (1)	3,120,000 6,240,000	ATSDR MRL - C ATSDR MRL - A	
Ammonia	16258/ 72575	22.4	0.6463 - 3.150	0.904	3.21	18.32/5.302 (4)	70 1190	ATSDR MRL - C ATSDR MRL – A	
Arsine	13 / 42,517	0.03	33.4 – 79.04	0.00756	24.7	1.756/0.0851 (1)	0.051 160	EPA RfC CA REL (Acute)	 1
Benzaldehyde	335 / 72,871	0.46	92.5 – 492.4	3.25	706	799.9/44.70	370 22	EPA Reg 3 - RBC TX ESL (ST) - odor	1, 2
Benzene	1440 / 72,562	1.98	142.5 – 454.6	6.81	343	865.4/ 76.37(4)	0.04 10 20 40	ATSDR CREG ATSDR MRL - C ATSDR MRL - I ATSDR MRL - A	1, 2

Abbreviations			
CREG	Cancer Risk Evaluation Guide	REL	Reference Exposure Levels (CA)
CV	Comparison Value	RfC	Reference Concentration (EPA)
ESL	Effects Screening Level, LT = long term, ST= short term	PRGs	Preliminary Remediation Goals
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	Notes	
ND	Not Detected	(1)	Average detection limit exceeded chronic comparison value
MDL	Method Detection Limit	(2)	Average detection limit exceeded short-term comparison value
RBCs	Risk-Based Concentration (EPA Region 3)		

Table 2 Continued	*Intel New Mexico Open Path FT-IR Summary (2003 – 2004)*								
Chemical	Total Number of Detections/ Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset)	CV (ug/m^3)	Comparison Value Source	Notes
Bromoform	32 / 42,653	0.08	111.7 - 256.4	0.294	392	215.3/8.448(1)	1.6	EPA Reg 3 - RBC	1, 2
Carbon Monoxide (1.15)	61789//72458	85.28	5.52 – 16.33	112	131	1029.5/437.9 (1)	2300 10000	CA Acute REL EPA NAAQS (8 hr)	
Carbon Tetrachloride	1,019 / 72,565	1.4	6.586 – 19.50	0.546	38.9	59.94/30.52 (1)	0.07 0.12 130 195	ATSDR CREG EPA Reg 3 - RBCs Texas ESL (ST) ATSDR MRL - I	1
Carbon Tetrafluoride	2,616 / 42,653	6.1	92.5 – 492.4	0.122	1.98	3.267(3) /0.3362(2)	18000	Texas ESL (ST)	
Carbonyl Fluoride	621 / 42,653	1.5	7.830 – 17.01	0.0909	6.24	6.291/0.2525 (1)	0.5 5.0	Texas ESL (LT) Texas ESL (ST)	1, 2
Carbonyl Sulfide	0/42653	0	5.073 – 11.75	0	0	0 0 0	0.8 8.0	Texas ESL (LT) Texas ESL (ST)	1, 2

Abbreviations

CREG	Cancer Risk Evaluation Guide
CV	Comparison Value
ESL	Effects Screening Level, LT = long term, ST= short term
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute
ND	Not Detected
MDL	Method Detection Limit
RBC	Risk-Based Concentration (EPA Region 3)
REL	Reference Exposure Levels (CA)
RfC	Reference Concentration (EPA)
PRGs	Preliminary Remediation Goals

Notes

(1) Average detection limit exceeded chronic comparison value
(2) Average detection limit exceeded short-term comparison value

Table 2 Continued	*Intel New Mexico Open Path FT-IR Summary (2003 – 2004)*								
Chemical	Total Number of Detections/ Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset)	CV (ug/m^3)	Comparison Value Source	Notes
Chloroform	8236/72972	11.3	12.2 - 25.86	2.85	25.2	46.96/23.95(5)	100 250 500	ATSDR MRL - C ATSDR MRL - I ATSDR MRL – A	
Chloromethane	121/42653	0.31	290.0 – 433.5	1.34	432	84.00 (2) /11.17(2)	104 414 1,350	ATSDR MRL - C ATSDR MRL - I ATSDR MRL - A	1
Ethanol	1,515 / 42,653	3.6	17.39 – 28.73	1.33	37.5	79.19/ 13.62(3)	18,800	Texas ESL (ST)	
Formaldehyde	354 / 72,873	0.49	3.427 - 20.91	0.119	24.5	56.25/4.218(1)	0.08 10 38 50	ATSDR CREG ATSDR MRL - C ATSDR MRL - I ATSDR MRL - A	1
Hexafluoro ethane	113 / 42,517	0.27	0.0232	0.019	8.73	2.095 (3)/ 0.1416 (2)	2820 28200	Texas ESL (LT) Texas ESL (ST)	

Abbreviations			
CREG	Cancer Risk Evaluation Guide	RBC	Risk-Based Concentration (EPA Region 3)
CV	Comparison Value	REL	Reference Exposure Levels (CA)
ESL	Effects Screening Level, LT = long term, ST= short term	RfC	Reference Concentration (EPA)
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	PRGs	Preliminary Remediation Goals
ND	Not Detected	Notes	
MDL	Method Detection Limit	(1)	Average detection limit exceeded chronic comparison value
		(2)	Average detection limit exceeded short-term comparison value

Table 2 Continued – N	***Intel New Mexico Open Path FT-IR Summary (2003 – 2004)***								
Chemical	Total Number of Detections/ Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset)	CV (ug/m^3)	Comparison Value Source	Notes
Hydrogen Chloride	12/42,219	0.03	11.47 – 34.42	0.003832	13.4	0.6328/0.02816 (1)	20 2100	EPA RfC CA REL (Acute)	2
Hydrogen Cyanide	52 / 42,219	0.12	21.89 - 39.6	0.0232	18.8	3.1416/0.2397 (1)	3.1 340	EPA Reg 3 - RBC CA REL (Acute)	1
Hydrogen Fluoride	17 / 42,192	0.04	0 - 34.44	0.0185	46	3.739/ 0.2787 (3)	16.7	ATSDR MRL –A	2
Isopropyl Alcohol	2422/7258	3.34	13.95 – 58.47	5.08	152	790.9/257.1 (1)	3200	CA REL (Acute)	
Methanol	1262/72575	1.74	7.729 – 14.93	0.243	14	11.63/2.433 (2)	1800 28000	EPA Reg 3 - RBC CA REL acute	
Methylene Chloride	121/42653	0.28	44.07- 88.04	0.202	71.1	30.96/1.439 (3)	3 1040 2080 7070	CREG ATSDR MRL- C ATSDR MRL - I ATSDR MRL - A	1

Abbreviations			
		RBC	Risk-Based Concentration (EPA Region 3)
		REL	Reference Exposure Levels (CA)
CREG	Cancer Risk Evaluation Guide	RfC	Reference Concentration (EPA)
CV	Comparison Value	PRGs	Preliminary Remediation Goals
ESL	Effects Screening Level, LT = long term, ST= short term	Data Set Number	
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	<u>Notes</u>	
ND	Not Detected	(1)	Average detection limit exceeded chronic comparison value

Table 2 Continued	*Intel New Mexico Open Path FT-IR Summary (2003 – 2004)*								
Chemical	Total Number of Detections / Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset)	CV (ug/m^3)	Comparison Value Source	Notes
Methyl Methacrylate	455/42653	1.07	7.71 - 18.00	0.114	10.7	11.12/0.7485 (2)	185 340	EPA Reg 3 - RBC Texas ESL (ST) – odor	
M-Cresol*	64 / 42,517	0.15	83.73 - 176.8	0.0815	54.1	14.76/0.9409 (2)	180	EPA Reg 9 PRG	
M-Xylene	81 / 42,653	0.19	118.0 - 234.8	0.294	155	34.76/1.226 (2)	220 2660 8,800	ATSDR MRL - C ATSDR MRL - I ATSDR MRL - A	1
N-Butyl Acetate	553 / 42,517	1.3	256.0 - 321.1	6.51	501	506.4 (2)/69.73(3)	185 1850	Texas ESL (LT) Texas ESL (ST) Odor	1
N-Butyl Alcohol	3,677 / 42,517	8.6	51.51 125.7	6.63	76.6	288.3/33.18(1)	61 610	Texas ESL (LT) Texas ESL (ST)	1

MDL Method Detection Limit	(2) Average detection limit exceeded short-term comparison value

Abbreviations		RBC	Risk-Based Concentration (EPA Region 3)
		REL	Reference Exposure Levels (CA)
CREG	Cancer Risk Evaluation Guide	RfC	Reference Concentration (EPA)
CV	Comparison Value	PRGs	Preliminary Remediation Goals
ESL	Effects Screening Level, LT = long term, ST= short term	Notes	
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	(2)	Average detection limit exceeded chronic comparison value
ND	Not Detected	(2)	Average detection limit exceeded short-term comparison value
MDL	Method Detection Limit		

Table 2 Continued – N	*Intel New Mexico Open Path FT-IR Summary (2003 – 2004)*								
Chemical	Total Number of Detections/ Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset # - page 7)	CV (ug/m^3)	Comparison Value Source	Notes
N-Butyraldehyde	926 / 72,873	1.3	11.58 – 238.6	1.01	79.5	113.5 (1)/ 10.13 (2)	1.4 14	Texas ESL (LT) Texas ESL (ST) - odor	1, 2
N-Hexane	6,878 / 72,872	9.4	16.94 - 121.4	28.5	302	10,950 (1)/1374 (1)	730 1760 2120	EPA Reg 3 - RBC Texas ESL (ST) ATSDR MRL - C	
Nitric Acid	1,153 / 72,866	1.6	15.08 - 1108	0.573	36.2	138.1 (2)/11.22(1)	86	CA Acute REL	2
Nitric Oxide	267 / 42,653	0.63	170.8-605.9	0.754	120	65.83 (2)/ 2.815(1)	30 300	Texas ESL (LT) Texas ESL (ST)	1, 2
Nitrogen Dioxide (1.88)	135 / 42,653	0.32	142.7 - 268.3	1.29	406	03.8/19.74 (1)	100 470	EPA NAAQS CA Acute REL	1
Nitrous Oxide	8,337 / 42,517	19.6	13.86 - 26.82	6.35	32.4	63.85 (2)/21.75(3)	90 900	Texas ESL (LT) Texas ESL (ST)	

Abbreviations			
		RBC	Risk-Based Concentration (EPA Region 3)
		REL	Reference Exposure Levels (CA)
CREG	Cancer Risk Evaluation Guide	RfC	Reference Concentration (EPA)
CV	Comparison Value	PRGs	Preliminary Remediation Goals
ESL	Effects Screening Level, LT = long term, ST= short term	Notes	
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	(1)	Average detection limit exceeded chronic comparison value
ND	Not Detected	(2)	Average detection limit exceeded short-term comparison value

Table 2-continued	*Intel New Mexico Open Path FT-IR Summary (2003 – 2004)*								
Chemical	Total Number of Detections/ Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset)	CV (ug/m^3)	Comparison Value Source	Notes
O-Cresol*	1,319 / 72,845	1.8	87.27 – 254.7	4.67	258	275.7 (3)/88.82(2)	180	EPA Reg 9 PRG	1
O-Xylene	1,855 / 73,000	2.5	92.53 – 252.2	5.79	228	661.9 (1)/39.09	220 2660 8,800	ATSDR MRL - C ATSDR MRL - I ATSDR MRL - A	1
P-Cresol*	178 / 42,517	0.42%	131.1-290.1	0.461	110	66.32(3)/2.713 (2)	18	EPA Reg 9 PRG	1
P-Xylene	148 / 42,653	0.35%	146.9 - 312.7	0.652	188	94.95/4.08 (3)	220 2660 8,800	ATSDR MRL - C ATSDR MRL - I ATSDR MRL - A	1
Phosgene	83 / 42,653	0.2%	9.315 - 17 .42	0.0196	10	2.129/0.1268 (1)	4	CA Acute REL	2
Phosphine	4 / 42,219	0.01%	18.9 – 26.83	0.00114	12	0.4593/0.0183 5 (2)	0.31	EPA Reg 3 - RBCs	1

MDL	Method Detection Limit

Abbreviations			
CREG	Cancer Risk Evaluation Guide	RBCs	Risk-Based Concentration (EPA Region 3)
CV	Comparison Value	REL	Reference Exposure Levels (CA)
ESL	Effects Screening Level, LT = long term, ST= short term	RfC	Reference Concentration (EPA)
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	PRGs	Preliminary Remediation Goals (EPAReg 9)
MDL	Method Detection Limit	Notes	
NAAQS	National Ambient Air Quality Standard (EPA)	(1) – Average detection limit exceeded chronic comparison value (2) – Average detection limit exceeded short-term comparison value	

Table 2-continued	– New *Intel New Mexico Open Path FT-IR Summary (2003 – 2004)*								
Chemical	Total Number of Detections / Frames	Percent Detected	MDL Data Set Range (ug/m^3)	Relative Avg ND=0 (ug/m^3)	Mean (detects only) (ug/m^3)	Maximum 1 hr/ 24 hr (ug/m^3) (dataset)	CV (ug/m^3)	Comparison Value Source	Notes
Propionaldehyde	231 / 42,517	0.54%	60.8 - 144.7	1.56	288	10.08/0.429 (3)	2 20	Texas ESL (LT) Texas ESL (ST) (odor) -	1, 2
Propylene Glycol Monomethyl Ether Acetate	1,639 / 42,219	3.9%	12.55 – 27.68	1.96	50.5	63.80/20.14 (1)	66 660	Texas ESL (LT) Texas ESL (ST) - (odor)	
Sulfur Dioxide (2.62)	27 / 42,653	0.06	166.1 - 334.3	0.0938	148	31.23/0.8013 (2)	26	ATSDR MRL - A	2
Sulfur Hexafluoride (5.98)	572 / 22,155	2.6	0.060	0.0392	1.52	2.317/0.2757 (3)	60 600	Texas ESL (LT) Texas ESL (ST)	

Abbreviations			
		RBCs	Risk-Based Concentration (EPA Region 3)
CREG	Cancer Risk Evaluation Guide	REL	Reference Exposure Levels (CA)
CV	Comparison Value	RfC	Reference Concentration (EPA)
ESL	Effects Screening Level, LT = long term, ST= short term	PRGs	Preliminary Remediation Goals
MRL	Minimal Risk Level, C= Chronic, I= Intermediate, and A= Acute	Notes	
ND	Not Detected	(1)	Average detection limit exceeded chronic comparison value
MDL	Method Detection Limit	(2)	Average detection limit exceeded short-term comparison value

For a majority of the compounds, the detection levels exceeded ATSDR, U.S. EPA, or state agency comparison values. This was because of the inherent limitations of the open path FTIR technology. Moreover, because of the data quality concerns noted previously, ATSDR could not use these data to perform a complete public health evaluation. Despite the data limitations, however, to the extent feasible, ATSDR attempted to evaluate the exposure pathways. For air contaminants detected in Intel-New Mexico's open path FTIR data sets, ATSDR used a commercial software program to plot the pollution-rose concentration of each chemical detected for each open path FTIR dataset. A pollution rose is a graphical depiction of the level of individual air contaminants detected in relation to the direction from which the wind was blowing. The plot was to determine whether any patterns emerged from these data. These graphs (see Appendix I) do not reveal any patterns between elevated ambient air concentrations and specific wind directions. These graphs are, however, limited by the sensitivity of the open path FTIR instrument (i.e., nondetects are not plotted). Therefore, the graphs alone cannot provide a complete indication of pollution patterns.

Summary of selected 1-hour peaks levels

ATSDR evaluated the 1-hour peak levels for chemicals detected more than 1 percent of the time and with sufficient sensitivity (i.e., average detection limit for the chemical was less then the corresponding health-based MRLs for acute exposure). Formaldehyde was included because the 1-hour peak coincided with acetaldehyde and with n-hexane 1-hour peak levels. ATSDR considers these data to be more sufficient for evaluation rather than for other compounds. These chemicals include acetaldehyde, ammonia, carbon monoxide, carbon tetrachloride, carbon tetrafluoride, chloroform, ethanol, formaldehyde, methanol, n-butyl alcohol, n-hexane, nitrous oxide and PGMEA. Table 3 summarizes for these selected contaminants the concentration, period, and wind direction. None of the levels measured as 1-hour maximums exceeded health-based comparison values.

Main findings of selected 1-hour peak levels: A review of peak 1-hour levels of selected chemicals and associated wind patterns suggest that the Intel-New Mexico facility may be the source of some of these chemicals. But the levels of select compounds measured with sufficient sensitivity and reliability by the open-path FTIR, (e.g., acetone, ammonia, carbon monoxide, isopropyl alcohol, and carbon tetraflouride) were below health-based comparison values and levels of health

For its monitoring periods, Intel-New Mexico reported meteorology observation from its open-path FTIR location and from its permanent 10-meter meteorology station. A comparison of meteorology observations between two stations (in Table 3) indicates marked difference in wind direction of up to approximately 60 degrees difference. Also, Intel-New Mexico's permanent station reported wind speeds approximately 50 to 100 percent greater than did the temporary meteorological monitoring stations. This variation is a result of the differences in meteorology station height (i.e., ground level for FTIR, versus the 10-meter above the ground level Intel-New Mexico permanent station) and the influence of the facility's large structure on local ground-level wind patterns. (Meteorology station siting criteria often include a 10-meter station height (about 32.5 feet) to minimize the influence of ground-level structures on wind speed and direction.)

Table 3 – Select 1 hour Maximum Levels from Intel-New Mexico Open Path FTIR

Chemical	**1-hour Maximum Level (ppb)-** (# of detections per # of frames)	Date –Time period	**FT-IR Wind Speed** (m/s) - Direction (deg)	**Intel Met Station Wind Speed** (m/s) - Direction (deg)	FT IR Location from Intel Plant (approximate wind direction relative to plant)	Comment
Acetaldehyde	81 ppb (57/57)	8/2/03 19:00 - 20:00	3.4 / 149	6.2/116	NW, downwind	1-hour peak formaldehyde occurred at this during this same period. Near peak for n-hexane
Ammonia	13.1 (42/55)	8/2/2003 19:21 - 20:20	3.2/166	6.1/132	NW, downwind	This peak occurred 20 minutes after peak for acetaldehyde. Two 26 and 25.5 ppb peaks occurred on 2/17/04 at 20:51 and 2/18/04 at 20:04 at the Mariquita Station east of Intel (and upwind of the station at the time of peak levels)
Ammonia	12.9 (57/57)	8/17/2003 21:41 - 22:40	1.3/195	2.2/176	NW, downwind	
Carbon Monoxide	891 (56/56)	8/7/03 06:10-07:10	0.67/349	1.3/316	NW, upwind	
Carbon Tetrafluoride	0.9 (53/56)	8/26/03 0:5:37-6:36	3.1/30	3.7/348	E, downwind from Intel Met Station	
Carbon Tetrafluoride	0.7 (56/56)	8/28/03 01:13-2:14	2.4/18	2.5/329	E, downwind from Intel Met Station	
Chloroform	10.3 (56/56)	3/3/04 10:14-11:14	1.5/135	2.5/107	E, upwind	

Table 3 - Continued

Chemical	1-hour Maximum Level (ppb)- (# of detections per # of frames)	Date –time period	FT-IR Wind Speed (m/s) - Direction (deg)	Intel Met Station Wind Speed (m/s) - Direction (deg)	FT IR Location from Intel Plant (approximate wind direction relative to plant)	Comment
Ethanol	41.9 (55/55)	9/04/03 14:33-15:32	2.4/202	3.6/142	E, downwind (FT) crosswind (Intel Met Station)	
Formaldehyde	46.3 (46/57)	8/2/03 19:00-20:00	3.4 / 149	6.2/116	NW, downwind	1-hour peak acetaldehyde occurred at this during this same period. near peak for n-hexane
Methanol	8.9 (35/56)	8/16/03 – 21:33-22:32	2.0/223	3.4/195	NW, upwind (FT IR)	
Methanol	8.8 (32/57)	8/21/03 4:09-5:08	0.6/266	1.6/299	NW, upwind	
N-Butyl Alcohol	95.1 (55/55)	8/3/07 18:19–19:18	2.0/280	3.0/273	NW, upwind	
N-Hexane	3100 (58/58)	8/2/07 16:27-17:26	4.4 /154	7.7/117	NW, downwind	
Nitrous oxide	35.5 (57/57)	8/17/03 8:02- 9:01	0.9/118	1.3/105	NW, downwind	
PGME (1)	17 (55/55)	8/7/07 20:39-21:38	1.3/191	1.9/168	NW, downwind	

(1) PGME - Propylene Glycol Monomethyl Ether Acetate

The 1-hour acetaldehyde maximum was detected on August 2, 2003 from 7 p.m. to 8 p.m. at the northwest corner of the Intel-New Mexico site. The wind was blowing from the southwest (from the direction of the plant) during this period. The maximum 1-hour level of formaldehyde also occurred at this exact time, and the maximum 1-hour level n-hexane occurred 40 minutes earlier. These coinciding peak levels suggest that combustion is the source of these peaks, given that acetaldehyde, formaldehyde, and n-hexane are known combustion byproducts. At ATSDR's request, Intel-New Mexico provided operational status of diesel generators and air pollution control equipment during the open path monitoring periods. Intel reported that during this period diesel generators were not operating.

Two 1-hour peak levels of ammonia (26.0 and 25.5 ppb) occurred on the Mariquita Lane FTIR monitoring location on Feb 17, 2004 and on February 18, 2004, at 8:51 p.m. and 8 p.m., respectively. The Mariquita Lane monitoring station was located in the eastern portion of Corrales, approximately 3 kilometers (2 miles) from the plant. During these two periods, the wind was blowing toward the Intel-New Mexico facility, suggesting that facility emissions likely did not cause these elevated concentrations.

A 13.1-ppb peak of ammonia occurred on August 2, 2003 from 7:21 p.m. to 8:20 p.m. at the northwest open path FTIR location, 20 minutes after the peak acetaldehyde and formaldehyde occurred when the wind was blowing from Intel-New Mexico towards the FTIR. A 12.9-ppb peak occurred on August 17, 2003, 9:41 p.m. to 10:41 p.m. when the wind was blowing in a northerly direction (from the plant toward the monitors).

The 1-hour carbon monoxide peak occurred from 6:10 a.m. to 7:10 a.m. on August 7, 2003. During this period the wind was blowing from the north, from the monitor toward the plant.

ATSDR plotted the carbon monoxide weekly levels as rolling 1-hour averages. These are plotted in Appendix F for each Intel-New Mexico open path FTIR monitoring location.

These plots indicate that peak levels coincide with morning and evening vehicle rush hours. The highest carbon monoxide levels occurred in the morning during periods of greatest atmospheric stability (i.e., the time of least mixing). The levels monitored were below U.S. EPA's National Ambient Air Quality Standard (NAAQS) for carbon monoxide of 9 parts per million (9,000 ppb) for an 8-hour period and 35 parts per million (35,000 ppb) for a 1-hour period.

The 1-hour peak levels of carbon tetrafluoride were observed at the eastern edge of the plant on August 26, 2003 at 5:37 to 6:36 a.m. (0.9 ppb) and August 28, 2003 from 1:14 a.m. to 2:14 a.m.. The monitor was downwind of Intel-New Mexico, based on Intel-New Mexico's meteorological station observation, with the wind coming from the northwest. During this period, however, the meteorological station at the monitor recorded wind from the northeast. The 1-hour peak level of ethanol (41.9 ppb) occurred on September 4, 2003 from 2:33 p.m. to 3:33 p.m.. Also during this period, the wind was blowing from the plant toward the monitor. The 1-hour peak level of PGME (propylene glycol monoethyl ether) was measured northwest of the plant and downwind of Intel-New Mexico on August 7, 2003 at 8:39 to 9:39 p.m.. Carbon tetrafluoride, ethanol, and PGME result from the semiconductor manufacturing process.

The 35.6-ppb 1-hour peak level of nitrous oxide occurred downwind of Intel-New Mexico, at the northwest monitoring station, on August 17, 2003 from 8:02 a.m. to 9:01 a.m.. Nitrous oxide originates from a number of sources, including fuel combustion (e.g., boilers, motor vehicles) and agriculture.

Overall, the majority of the1-hour peaks measured downwind from Intel-New Mexico occurred at night or in the early morning.

Table 3 also indicates that 1-hour peak levels of chloroform, methanol, and n-butyl alcohol were measured when the wind was blowing toward Intel-New Mexico (i.e., the monitor was upwind of the facility). ATSDR has, however, judged the peak levels of methanol to be less reliable; during the 1-hour period the open path FTIR monitor detected methanol approximately 50 percent of the time. This infrequent methanol detection suggests reduced sensitivity, possibly due to unfavorable environmental or operational conditions (e.g., humidity, beam misalignment).

Crystalline Silica

One concern raised by the community is the possibility of exposure to crystalline silica from Intel-New Mexico Plant air emissions. Intel-New Mexico uses hexamethyldisilizane (HMDS), a silicon-based compound, in semiconductor lithography processes. HMDS is evaporated and captured in process exhaust. When combusted in thermal oxidizers, HMDS oxidizes to a silica dioxide powder.

The formation of crystalline silica from amorphous silica dioxide (found in HMDS) requires extreme temperature and slow cooling times (NIOSH 2003). The transformation of amorphous silica to crystalline silica will not occur at temperatures below 800 degrees Celsius (1472 degrees Fahrenheit). Intel New-Mexico's thermal oxidizers are required to operate at hourly-average temperatures 1385 degrees F. Therefore, crystalline silica is unlikely from the operation of Intel-New Mexico's thermal oxidizers.

Previous sampling by Intel-New Mexico did not detect the presence of crystalline silica in the thermal oxidizer air stream exhaust (Intel Corporation, 2004). ATSDR is, however, recommending additional bulk sampling of thermal oxidizer residue for crystalline silica to verify this finding.

Phosgene

The community raised concerns about possible exposure to phosgene since this air contaminant was detected by the Intel and New Mexico Environment Department open path FTIRs. Phosgene can be formed when chlorinated hydrocarbon compounds (e.g. chloroform) are exposed to high temperatures, such as what occurs in thermal oxidizers. Intel-New Mexico reports, however, that its exhaust ventilation system is designed to prevent corrosive chlorine-containing gases from being vented to the thermal oxidizers. This would preclude the formation of phosgene from Intel operations.

NMED later determined the phosgene detections to be false positives through additional spectral analysis. ATSDR did not attempt to reevaluate false positive determinations made by NMED. For several reasons cited in this health consultation, ATSDR does not have complete confidence in the open path FITR monitoring data for evaluating potential health impacts of air emissions on the community. Therefore, ATSDR recommends that Intel-New Mexico, in partnership with New Mexico, provide information to the community on the process controls and safety measures that prevent the formation of phosgene during Intel-New Mexico plant operations.

Toxic Release Inventory (TRI) Data

The Federal Emergency Planning and Community Right-to-Know Act (EPCRA) requires facilities—such as Intel-New Mexico—that manufacture, process, or otherwise use significant amounts of toxic chemicals, to report annually their releases of these chemicals. The report, known as the Toxics Release Inventory (TRI), contains information about the types and amounts of toxic chemicals that are released each year to the air, water, and land. The primary purpose of EPRCRA is to inform communities of chemical hazards in their areas (USEPA 2008).

> **What Is the Toxics Release Inventory?**
>
> Starting in 1987, the U.S. Environmental Protection Agency (EPA) required facilities in certain industries to disclose the amounts of specific toxic chemicals that they release to the environment or manage as waste. The Toxics Release Inventory (TRI) is the publicly accessible database that contains the information submitted by facilities that meet the reporting requirements.
>
> EPA's Web site on the TRI program (www.epa.gov/tri) presents extensive additional information on the strengths and limitations of using TRI data.

ATSDR often uses TRI data as part of ATSDR's evaluation of facilities that release toxic chemicals into the environment since TRI data are useful for indicating the types and amounts of annual air emissions from industrial facilities that use reportable chemicals and how the reportable emissions change over time. However, these data have limitations. For instance, TRI data are self-reported by industry, and the accuracy of these data is not known. Further, while TRI data offer extensive insights into large air emission sources, the data are not comprehensive because of various reporting exemptions. For example, facilities in certain industrial sectors, facilities with fewer than 10 employees, and facilities with relatively small toxic chemical uses are exempt from reporting. In addition, TRI data do not include emissions data from non-industrial sources, like motor vehicles. Finally, TRI reporting requirements have changed over the years, which can complicate efforts to interpret trends.

In general, TRI data provide useful insights into the relative magnitude of certain industrial emissions sources and help identify site-related pollutants of potential concern, but these data alone often are insufficient for drawing inferences about exposures and potential health effects; therefore, TRI air emissions data alone cannot determine whether air emissions present a public health hazard .

Intel-New Mexico's TRI total air emissions for the period 1988 through 2006 are graphed in Appendix G. These graphs indicate that the facility's air emissions have varied over time (from 14,916 pounds in 1994 to 133,953 pounds in 1993). These variations are due to changing plant operations and production volume and to changes in the TRI reporting requirements. Several changes to the TRI reporting requirements pertain to chemicals that are widely used in the semiconductor manufacturing industry:

After 1993, U.S. EPA removed acetone from the TRI reporting requirements (USEPA 1999b). U.S. EPA added N-methyl-2-pyrrolidone to the reporting requirements in 1995. U.S. EPA modified the listing of isopropyl alcohol in a manner that limited reporting to facilities that manufacture the chemical in a specific manner. As a result of this modification, facilities such as Intel-New Mexico that simply use the chemical no longer had to report chemical releases to TRI. Thus, emissions of isopropyl alcohol are not documented in Appendix G, despite Intel-New Mexico's emissions inventories document identifying releases of this chemical. Excluding acetone emissions (another chemical that no longer requires reporting), Intel-New Mexico's total TRI air emissions peaked in 2004 at 107,000. Ammonia comprised over 80 percent of this amount. In 2006, Intel-New Mexico reported emitting 30,815 pounds of TRI-reportable chemicals into the air. Ammonia comprised over half these emissions. Chlorine, nitric acid, hydrofluoric acid, and methanol comprised most of the remainder.

The majority of Intel-New Mexico's emissions occurred from point sources (e.g., thermal oxidizer stacks, scrubbers, and cooling towers). Some, however, were fugitive emissions best characterized as passive releases that did not occur through a confined process stream, such as a vent or a stack. Excluding acetone, total fugitive air emissions ranged from 35 pounds in 1995 to 3,536 pounds in 1996. In 2004 through 2006, total fugitive emissions ranged from 990 to 1882 pounds. In 2004 and 2005, Intel-New Mexico released via fugitive emissions 750 and 746 pounds, respectively, of hydrofluoric acid. In 2006, Intel-New Mexico released 1882 pounds of TRI-reportable chemicals via fugitive air emissions. The majority of these fugitive emissions were methanol.

Public Health Implications

On the whole, ATSDR cannot fully evaluate the public health implication of community exposure from these data:

- The FTIR ambient air monitoring data are not completely adequate; detection limits exceeded the health-based comparisons values for many of the chemicals.
- At this time, because of the wide fluctuation of the limit of detection for many chemicals, ATSDR cannot characterize accurately short-term or long-term average exposures.
- Also at this time, ATSDR cannot estimate the public health impact of exposure without having accurate estimates of individual compounds.

ATSDR judged some of the data (Table 3) to be adequate for evaluation. None of the measured concentrations in Table 3 exceeded their corresponding health-based comparison values.

Occupational Epidemiology Studies

Occupational epidemiology studies have been helpful in evaluating potential occupational health hazards for semiconductor workers. But occupational epidemiology studies are less useful in evaluating community health concerns. While the general public (i.e., community) may be more sensitive to chemical exposures than are workers, community exposures to air contaminants are typically much lower than workplace exposures. Moreover, community exposure to semiconductor emissions is less likely to involve multiple pathway exposure (e.g., inhalation and dermal).

Occupational epidemiology studies, including one semiconductor industry-funded study, found some evidence of increased spontaneous abortions among women working at semiconductor facilities (Schenker, 1995). These reports prompted Intel-New Mexico in the mid 1990s to remove glycol ethers from manufacturing process. The last year that Intel-New Mexico reported releasing glycol ethers via air emissions was 1994.

In 2007, the University of Alabama published the results of the largest cancer study of semiconductor workers to date. Funded by IBM, this study found fewer expected cases of cancer among semiconductor workers compared with the general population (Bender et al 2007). Yet this study has some important limitations: 1) the young age of the workers compared with the general population, 2) possible selection bias due to temporal and geographical restrictions, and 3) lack of chemical-specific exposure information (Bender et al 2007). The Semiconductor Industry Association has contracted with Vanderbilt University to conduct another cancer epidemiology study of the semiconductor workers, which is scheduled for completion in 2009 (Semiconductor Industry Association 2008).

Odors and Health

Corrales residents reported noticing various odors, including burnt coffee, solvent, and acetone-like odors (Petitioner 2004; NMED 2004c). The reported symptoms included a “seizing feeling in the upper respiratory tract,” temporary loss of vision, breathlessness, sinus irritation, pneumonia, nightmares, and insomnia. Some residents filed numerous complaints about these odors. Odors were often reported at night during periods of stable atmospheric conditions. NMED previously reported that the majority of complaints were made by a limited number of persons. This may be attributed to the complainants’ proximity to the plant, individual variability of odor perception, and awareness of reporting mechanisms.

That said, however, Intel-New Mexico’s open-path FTIR monitoring results suggest that some chemicals may be found in the community at levels above their corresponding odor thresholds during short periods. These chemicals include acetaldehyde, benzaldehyde, formaldehyde, and n-butyraldehyde. These compounds can come from several sources, but they are commonly associated with fuel combustion. Still, because of temporal and analytical monitoring limitations, this list of chemicals may not be comprehensive. For example, open-path FTIRs may not detect all the odorous compounds, but exposure to some of the chemicals intermittently detected by open path FTIR can exhibit responses similar to complaints expressed by residents.

Intel-New Mexico emits chemicals (e.g., ammonia) capable of resulting in unpleasant odors in the community, but the facility has implemented several strategies to reduce emission of such odorous substances. Thermal oxidizers that have operated at the facilities for many years reduce emissions of odorous substances. Exposures to these odorous substances, however, may have been higher before the thermal oxidizers were installed and may continue to be higher when the thermal oxidizers are shut down for maintenance. To further address this issue, Intel-New Mexico has taken steps to reduce substantially the down time of air pollution control equipment, and the facility no longer uses certain odorous compounds (e.g. glycol ethers).

Moreover, some of the odors detected near Intel-New Mexico might result from emissions from other nearby sources. For instance, motor vehicle-filling stations, dry cleaners, a crematorium, a waste water treatment plant, and agricultural operations are all within close proximity to Intel-New Mexico and may contribute to odors detected by the community. As evidence of this, 1-hour peak levels of ammonia occurred when the wind was blowing from the east, toward Intel-New Mexico.

Still, residents continue to report odor complaints to Intel-New Mexico and NMED, which in turn informs Intel-New Mexico of odor complaints that appear to be specific to that facility. Intel-New Mexico responds to all odor complaints and summarizes these complaints in its monthly Environmental, Health, and Safety (EHS) activity report. Intel-New Mexico’s procedures for investigating odor and air quality complaints include

- Intel-New Mexico asks for the name, phone number of the complainant, and description of the odor.
- Facility personnel then assess the status of its air pollution controls and weather conditions.
- If necessary, the facility's Emergency Response Team is dispatched to check the perimeter for detectable odors.
- Intel-New Mexico reports its findings back to the person who filed the complaint and, through "Intel Activity Reports," to the CEWG.

The relationship between odor and human health is not fully understood. Odors are complex, quantifying odorous compounds is difficult, and human response to odors varies greatly. Historically, unpleasant environmental odors have been recognized as "warning" signs of potential risks to human health, although not direct triggers of health effects. Depending on many individual and environmental factors, odors from environmental sources may cause health symptoms. Recent research suggests that some people may experience some adverse health symptoms such as headaches and nausea resulting from exposure to unpleasant environmental odors (Shiffman and Williams 2005). Yet a great deal remains to be learned about relationships of odor and human health.

ATSDR and U.S. EPA have established their comparison values (i.e., Minimal Risk Levels and Reference Concentrations) based on adverse toxicological effects rather than odor perception. As such, ATSDR bases its public health conclusions on the airborne levels of odor-causing pollutants rather than on the presence of odors. While open path-FTIR monitoring suggests malodorous substances are present in air near Intel-New Mexico at times, the limitation of the technology and science impedes our ability to evaluate the effects of the odorous compounds.

Near-Roadway Exposures

Though the focus of this health consultation is on air quality impacts of pollutants released from the Intel-New Mexico, ATSDR found that ambient air concentrations of several pollutants near industrial facilities are typically affected by a number of sources, including mobile sources. The presence of mobile source air toxics in outdoor air is well-documented for nearly every urban and suburban location where air pollution measurements have been collected. ATSDR includes this finding in the health consultation to provide residents some background information on the different factors that affect air quality. Information provided in this section is not meant to imply that Rio Rancho's air quality is affected more by mobile sources than by the Intel-New Mexico, or vice versa.

The extent to which mobile sources contribute to air pollution levels varies considerably from one pollutant to the next. For carbon monoxide, nitrogen oxides, and volatile organic compounds, mobile sources generally account for a substantial portion of pollutant releases in urban settings. Many hazardous air pollutants—including some known carcinogens—also originate from mobile sources. EPA has recently estimated that roughly one-third of Americans live in locations where mobile source air toxics account for air pollution levels that present an elevated theoretical lifetime cancer risk, and these risks are most pronounced in areas with the greatest motor vehicle traffic (EPA 2007). With the advent of cleaner mobile source technologies (both for vehicles and fuels), however, air quality impacts from mobile sources and associated health risks are expected to decrease in coming years.

While mobile sources may be a factor in some of Rio Rancho's air quality issues, mobile sources are not a dominant factor for all pollutants. For example, mobile sources likely account for only a small fraction of the malodorous pollutants found in ambient air near the Intel –New Mexico. Several other pollutants identified during the air pollution studies (e.g., chlorinated compounds) also generally do not originate from mobile sources in considerable quantities.

Overall, the previous discussion is meant to offer some insights into the various factors that affect air quality in urban and suburban settings. While scientists may debate the precise extent to which mobile sources or industrial sources affect air pollution levels, it is important to note that the findings in this health consultation are based on the actual air pollution levels measured in multiple studies, regardless of the origin of those air pollutants.

Limitations

Several important limitations qualify this health consultation and data review. These limitations include but are not limited to:

Environmental Data:

- The 2003–2004 sampling and monitoring data span a total of approximately 10 weeks. While those data provide some insight into air quality during those periods, because of the frequent changes in plant processes, production levels, and pollution control equipment, the data likely are not representative of conditions when monitoring did not occur.

Methods

- The open path FTIR monitoring technology is limited (e.g., highly variable detection limits).

Health Information

- Scientific limitations restrict any understanding of the health effects of odors and exposure to chemical mixtures.

Conclusions

Intel-New Mexico's air permit requires both direct measurements of air emissions from certain facility processes and, using calculations, estimation of facility-wide emissions. These emissions data are useful for identifying chemicals to evaluate in public health evaluations. Several opportunities are available to gather additional data that could increase confidence in the emissions data. This would help address community concerns expressed to ATSDR on this matter.

Overall, the Corrales Air Quality Task Force Study modeling provided useful insights into the meteorological conditions around Intel-New Mexico. It also predicted outdoor air pollution levels for several pollutants, but these estimated levels have inherent uncertainties and limitations that prevent ATSDR from basing health conclusions on these modeling estimates alone. For example, the accuracy of the modeling results depends on the accuracy of the emission rate inputs: any positive or negative biases in the emission rate inputs propagate through the dispersion models and into the modeling results. Additionally, assumptions made when running the model (such as how to allocate emissions between different sources) can affect the modeling results. These inputs and assumptions impact the model's output, i.e. actual air pollution levels may have been lower or higher than the model predictions. Thus, rather than basing important health conclusions on these estimates, ATSDR placed a greater emphasis on reviewing outdoor air quality measurements collected near Intel-New Mexico. Additional ambient air monitoring could provide needed information to more fully evaluate possible community exposures to several pollutants.

During a span of approximately 10 weeks in 2003 and 2004, Intel-New Mexico and NMED used continuous, open-path FTIR monitoring to measure, adjacent to its facility, the ambient air concentrations of numerous chemicals. Results from these monitoring efforts are not adequate to evaluate fully the potential public health consequences of air emissions from Intel-New Mexico. The primary limitation of the technology is its inability to measure low levels of multiple air contaminants over time. Consequently, the detection limits for many contaminants often exceeded the health-based comparison values; in other words, the measurement method was not sensitive enough to measure ambient air concentrations at levels ATSDR typically considers in its health evaluations. As a result, ATSDR cannot fully evaluate potential exposure to nearby residents, nor can ATSDR address the potential health impact of chemical mixtures

A review of peak 1-hour levels of selected chemicals and associated wind patterns suggest that the Intel-New Mexico facility may be the source of some of these chemicals. But the levels of select compounds measured with sufficient sensitivity and reliability by the open-path FTIR, (e.g., acetone, ammonia, carbon monoxide, isopropyl alcohol, and carbon tetraflouride) were below health-based comparison values and levels of health concern.

During brief periods, the open-path FTIR detected some compounds at levels above their odor thresholds. These included acetaldehyde, benzaldehyde, formaldehyde and n-butyraldehyde. Some of the chemicals intermittently detected by open-path FTIR monitors could be associated with odors reported by the community.

Recommendations

ATSDR has provided NMED a letter describing opportunities for gathering additional insight into the Intel facility emissions.

ATSDR recognizes environmental sampling and monitoring is resource intensive and any additional sampling/monitoring efforts would depend on the availability of resources. However, because of the uncertainty associated with previous modeling studies, FTIR data and because of ongoing community concern about air emissions from the Intel-New Mexico Plant, ATSDR recommends that public health and environmental agencies explore the possibility of conducting additional sampling or monitoring to characterize residential exposures, specifically in the community and particularly immediately southeast of Intel-New Mexico. Some possible analytes may include

- acidic gases (hydrogen fluoride),
- aldehydes,
- ammonia, and
- VOCs,

In addition, Intel-New Mexico should consider conducting additional (bulk) analysis of thermal oxidizer build-up for crystalline silica using National Institute for Occupational Safety and Health (NIOSH) methods and laboratory accredited by the American Industrial Hygiene Association (AIHA, 2009).

Intel-New Mexico, in partnership with New Mexico, should provide information to the community on the process controls and safety measures that prevent the formation of phosgene during Intel-New Mexico plant operations.

Regarding community air quality complaints, Intel-New Mexico should continue to respond to odor complaints and report complaints, and consider the following:

- Posting a monthly summary of air quality complaints and its response activities on its web page (with CEWG meeting summaries). Posting should include time of complaint, description of odor or complaint, general location or (zone), status of plant air pollution control and general equipment, and summary of wind speed and direction during the complaint period.
- Evaluating, summarizing, and reporting air quality complaint trends on a periodic basis.
- Initiating efforts to inform the nearby community on how to report air quality and odor concerns and educating the community on Intel-New Mexico's air quality investigation procedures.

ATSDR should conduct health education for local area physicians on effects of environmental odors and air contaminants.

Intel-New Mexico should continue its ongoing efforts to reduce and control air emissions through improvements in its engineering and administrative controls.

Public Health Action Plan

Since accepting the petition to evaluate community health concerns regarding the Intel-New Mexico facility, ATSDR has conducted- and continues to conduct- various activities to evaluate air pollution levels and to coordinate with the local community. A timeline of the main activities to date are as follows.

- February 2005 – ATSDR conducted a site visit and held meetings with the petitioner, the community, New Mexico Environment and New Mexico Health Department staff, and Intel-New Mexico management, and toured the Intel New Mexico facility.
- June 2006 – ATSDR conducted a review the New Mexico Environment Department files.
- November 2007 – ATSDR conducted a follow-up visit,
    - held a meeting with the petitioner,
    - held public meetings with the community and provided health education to the community on environmental odor, and environmental cancers
    - held a meeting with the New Mexico Health Department, and
    - held a follow-up meeting with Intel-New Mexico managers.
- October 2008 – ATSDR met with EPA Region VI air program managers.
- December 2008 – ATSDR submitted a draft health consultation to New Mexico Health Department and New Mexico Tumor Registry regarding a review of Sandoval County cancer incidence rates.

Future activities

- February 2009 – ATSDR plans on conducting physician health education to inform local area physicians on effects of environmental odors and air contaminants
- February 2009 – ATSDR plans on holding public availability meetings in Rio Rancho, New Mexico to discuss this health consultation.
- During the public comment period of this health consultation, ATSDR will discuss with stakeholders the possibility of conducting air monitoring to characterize residential exposures, specifically in the community immediately Southeast of Intel-New Mexico. Some possible analytes may include: acidic gases (hydrogen fluoride), ammonia, aldehydes, and VOCs.
- ATSDR will release a health consultation that provides a summary of the Sandoval County, New Mexico cancer incidence rates.

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References

[ATSDR] Agency of Toxic Substances and Disease Registry. 2006. Public health assessment guidance manual. Atlanta: US Department of Health and Human Services.

American Industrial Hygiene Association 2009. Industrial Hygiene Laboratory Accreditation Program (IHLAP) Washington DC. Available online at

http://www.aiha.org/Content/LQAP/accred/IHLAP.htm [last accessed January 6, 2009.]

American Lung Association. 2007. Interstitial lung disease and pulmonary fibrosis. New York. Last accessed May 8, 2008. Available at: http://www.lungusa.org/site/apps/nlnet/content3.aspx?c=dvLUK9O0E&b=2060161&content_id={4350F20F-98E4-403B-A33B-68B20A3C2FBA}&notoc=1 [last accessed on January 6, 200]

ASTM International. 2007. Standard practice for Open-Path Fourier Transform Infrared (OP/FTIR) monitoring of gases and vapors in air, West Conshohocken, PA. ASTM E1982-98.

Bender TJ, Beall C, Cheng H, Herrick R , Kahn AR, Matthews R, et al. 2007. Cancer incidence among semiconductor and electronic storage device workers. Occup Environ Med 64:30–36.

Bureau of the Census. 2006 Fact Sheet for Sandoval County, New Mexico. Washington: US Department of Commerce; 2006. Available from: http://factfinder.census.gov/servlet/SAFFFacts?_event=ChangeGeoContext&geo_id=05000US35043&_geoContext=01000US%7C04000US35%7C16000US3563460&_street=&_county=sandoval&_cityTown=sandoval&_state=04000US35&_zip=&_lang=en&_sse=on&Active [last accessed January 6, 2009].

Bureau of the Census. 2008 DP-1 Profile of General Demographic Characteristics: 2000 for Rio Rancho City, NM . Washington:. Available from: http://factfinder.census.gov/servlet/QTTable?_bm=y&-geo_id=16000US3563460&-qr_name=DEC_2000_SF1_U_DP1&-ds_name=DEC_2000_SF1_U&-_lang=en&-redoLog=false&-_sse [last accessed January 6, 2009].

[ERM] Environmental Resources Management. 2005. RM, Risk Assessment for the Intel Rio Rancho facility: project summary and overview. Greenwood Village, CO; 2005 July 22.

Gradient Corporation. 2004. Human health risk characterization, Corrales environmental health air quality evaluation. Prepared for New Mexico Environment Department. Cambridge, MA; 2004 March 25.

Intel Corporation. 2004. Silicon dioxide characterization from Intel, NM recuperative thermal Oxidizers. Santa Clara. April 28, 2004. Available from: http://www.intel.com/community/newmexico/pix/2008_03_Silicon_Dioxide_Characterization.pdf [last accessed January 6, 2009].

Intel Corporation. 2008. About Intel New Mexico. Santa Clara, CA.. Available from: http://www.intel.com/community/newmexico/index.htm. [Last accessed January 6, 2009.]

Intel Corporation. 2007. Intel site operations presentation to the Community Environmental Working Group. Intel-New Mexico, 2007 September. Santa Clara, CA. Available from: http://www.intel.com/community/newmexico/neighborrelations/2007_10_IntelSiteOperations.pdf [Last accessed January 6, 2009]

Lee CW, Mohr SN, and Weisel CP. 2001. Toxicokinetics of human exposure to methyl tertiary-butyl ether (MTBE) following short-term controlled exposures. J Exp Anal and Env Epi (11), 67–78.

Lioy PJ, Weisel CP, Jo W, Pelizzari E, and Raymer JH. 2001. Microenvironmental and personal measurements of methyl tertiary butyl ether (MTBE) associated with automobile use activities. J Exposure Anal Environ Epidemiol 4(4):427–41.

New Mexico Environment Department. 2003. Quality assurance project plan for ambient air toxic monitoring in Corrales, New Mexico. Santa Fe: State of New Mexico Environment Department; May.

New Mexico Environment Department. 2003. Corrales Toxic Air Pollutant Emission Inventory Report. Santa Fe; September.

New Mexico Environment Department. 2004a. Press Release: "Environment Department Releases Human Health Risk Study for Corrales Airshed" Santa Fe: State of New Mexico Environment Department; March 26.

New Mexico Environment Department. 2004b. Corrales Project 2003 Monitoring Data Report Air Quality Bureau. Santa Fe, NM; January.

New Mexico Environment Department. 2004c. Corrales Environmental Health Evaluation Community Process Summary Report. Santa Fe; June. Available from: http://www.nmenv.state.nm.us/aqb/projects/Corrales/report/Summary-Project-Report.pdf.

[last accessed January 6, 2009]

New Mexico Environment Department. 2007. Wind rose for Intel Corporation, downloaded from NMED's Web site for "Dispersion Modeling – Meteorological Data." Available from: http://www.nmenv.state.nm.us/aqb/modeling/metdata.html [last accessed January 6, 2009].

Petition Letter regarding the Intel-New Mexico Site. 2004. Community member's letter to ATSDR. Atlanta, Georgia; July 19 (Petitioner's name withheld).

Radford J. 2005. Health survey statistics link proximity to Intel with illness. Corrales *Comment*. Corrales, NM; 2005 November 24.

Schiffman SS, Williams CM. 2005. Science of odor as a potential health issue. J Environ Qual. 2005 Jan-Feb;34(1):129–38.

Schenker MB, Gold EB, Beaumont JJ, Eskenazi B, Hammond SK, Lasley BL, McCurdy SA, Samuels SJ, Saiki CL, Swan SH. 1995 Association of spontaneous abortion and other reproductive effects with work in the semiconductor industry. Am J Ind Med. Dec;28(6):639-59.

Texas Commission on Environmental Quality. 2006. Guidelines to develop effects screening levels, reference values, and unit risk factors. Austin, RG-442; 2006 November.

Terry CE, Ryan RP, editors, and Leffingwell SS. 1999. Toxicology desk reference. Philadelphia: CRC Press.

TRC Environmental Corporation. 2003. Open Path FTIR field monitoring data results. August/September 2003 Intel Corporation, Rio Rancho, New Mexico. Littleton Co: 2003 December 1.

[USEPA] US Environmental Protection Agency. 1996. Open Path FTIR Monitoring guidance document). Research Triangle Park, NC. USEPA/600/R-96/040.

[USEPA] US Environmental Protection Agency. 1999. Compendium Method TO-16 Long Path Open Path Fourier Transform Infrared Monitoring of Atmospheric Gases. Environmental Protection Agency: Cincinnati.

[USEPA] US Environmental Protection Agency. 1999. Toxic Release Reporting Inventory. Reporting Guide for the Semiconductor Industry. Environmental Protection Agency. Washington DC. Available from: http://www.epa.gov/tri/guide_docs/1999/semicond.pdf

[USEPA] US Environmental Protection Agency. 2008. What is the Toxic Substance Release Inventory Program. Environmental Protection Agency. Washington DC available from http://www.epa.gov/tri/triprogram/whatis.htm

[USEPA] US Environmental Protection Agency. 2008. County Air Quality Report - Criteria Air Pollutants Sandoval County, NM. Available at: http://iaspub.epa.gov/airsdata/adaqs.summary?geotype=co&geocode=35043&geoinfo=co%7E35043%7ESandoval+Co%2C+New+Mexico&year=2008+2007+2006+2005+2004+2003+2002+2001+2000+1999+1998&fld=county&fld=stabbr&fld=regn&rpp=25

[USEPA] U.S. Environmental Protection Agency. 2007e. 1999 National-Scale Air Toxics Assessment (NATA). Available at http://www.epa.gov/ttn/atw/nata1999. Site last accessed on February 7, 2007.

[USEPA] U.S. Environmental Protection Agency. 2009. Response to Request for Comments on Data Validation Draft of Public Health Consultation Review of Air Quality Data Public Comment Release Intel Corporation-New Mexico Facility.

Appendix A. Responses to Community Concerns

Community Concern – Physician Education

Environmental health associated disease is a reportable condition in New Mexico but throughout the area physicians are not educated or reluctant to report such illnesses.

ATSDR Response

ATSDR is recommending physician health education to inform local area physicians about the relationship between environmental exposures and health.

Community Concern - Odors

A air quality complaint log is maintained by NMED. The New Mexico Department of Health is copied on complaints but does not follow-up on them. Odor complaints are still occurring after the installation of the thermal oxidizers. Some residents have stopped calling Intel-New Mexico and NMED to complain about the odors because they perceive that no action results from the calls. Intel-New Mexico receives community odor complaints via hotline. Intel-New Mexico has a hotline residents can call.

One person who lives several miles southeast of plant can smell odors that she attributes to the Intel-New Mexico. Odors occur more frequently and are stronger at night. Cooling towers have been source of odors. Odorant was previously added to cooling towers to mask odors (no longer done).

Common symptoms expressed include strong odors, headaches, eye irritation, burnt coffee, and acetone odors.

Other symptoms expressed include “seizing feeling in the upper respiratory tract,” temporary loss of vision, lack of breath, sinus irritation, pneumonia, nightmares, and insomnia.

ATSDR Response

Over the past several years, Intel-New Mexico has taken steps to reduce thermal oxidizer down time during routine maintenance activities. This has reduced emissions associated with thermal oxidizer bypass and associated odors. Intel-New Mexico has also recently replaced its thermal oxidizers to achieve increased reliability and to have “redundancy” in these pollution controls—meaning an unexpected shutdown of one device would mean that another device would operate to reduce emissions.

ATSDR is recommending that Intel-New Mexico work with its stakeholders to enhance its odor investigation and follow-up procedures. ATSDR is also recommending additional environmental sampling in the community to better assess community exposures to specific air pollutants.

Community Concern – Corrales Air Quality Task Force (CAQTF)

The community feels slighted by the abrupt end of the CAQTF in the Spring of 2004 and lack of ability to testify during an appeal of Intel-New Mexico's air permit in the late 1990s.

ATSDR Response

The overall management of the CAQTF and its termination are beyond the scope of ATSDR's public health assessment process. ATSDR encourages residents who are concerned about air emissions from Intel-New Mexico to participate in NMED permitting processes and to participate in Intel-New Mexico's Community Environmental Working Group (CEWG) meetings. Community members can voice their concern to U.S. EPA Region 6 if they believe that state regulators are not adequately addressing their concerns.

Community Concern - Mixtures

The semiconductor industry is a relatively new industry, and toxicity of many semiconductor emissions and mixtures is not known. Emissions are assumed harmless until proven otherwise.

ATSDR Response

ATSDR is concerned about the potential effects of exposure to chemical mixtures and has established guidance procedures for addressing chemical mixtures. See http://www.atsdr.cdc.gov/interactionprofiles/ipga.html. An accurate assessment of exposure is, however, necessary to use this guidance.

Community Concern - Medical Conditions

One resident's son has Battens syndrome.

ATSDR Response

Batten's syndrome, also called neuronal ceroid lipofuscinosis, is rare, fatal, inherited disease. Batten's syndrome is not known to be associated with environmental exposures.

Community Concern - Silica

Two deaths of residents were attributed to interstitial pulmonary fibrous; particulate is regularly found in dog's water dish and on vehicles in area; and the neighborhood is without particulate monitoring.

A community member who toured the plant observed a heavy build-up of crust on the thermal oxidizer units during a plant tour.

ATSDR Response

Interstitial lung disease (ILD) is a group of more than 130 lung diseases characterized by scarring or inflammation of the lungs. Some of the causes of ILD include connective or autoimmune disease, occupational and environmental exposure to dusts (including silica), drugs and poison, genetics, and infections (American Lung Association 2007).

Hexamethyldisilizane (HMDS) is a silicon-based compound used in semiconductor lithography processes. HMDS is evaporated and captured in process exhaust. When combusted in thermal oxidizers, HMDS oxidizes to a silica dioxide powder.

The formation of crystalline silica from amorphous silica dioxide requires extreme temperature and slow cooling times (NIOSH 2003). The transformation of amorphous silica to crystalline silica will not occur at temperatures below 800 degrees Celsius (1472 degrees Fahrenheit). Intel New-Mexico's newest Munter thermal oxidizers are required to operate at hourly-average temperatures of 1385 degrees F. Therefore, crystalline silica is unlikely to occur during the operation of the Intel-New Mexico's thermal oxidizers.

Previous bulk sampling of residue by Intel-New Mexico did not detect the presence of crystalline silica in the thermal oxidizer air stream exhaust (Intel Corporation 2004). ATSDR is, however, recommending additional sampling for crystalline silica to verify this finding.

Community Concern – Pets

An autopsy of a dog that lived in the community indicated presence of n-hexane in liver.

ATSDR Response

Numerous sources of n-hexane exist in the environment; it is a component of gasoline and also a byproduct of combustion. ATSDR cannot determine from autopsy results the source of the exposure to n-hexane or if this chemical exposure contributed to the dog's death.

Community Concern – Dead Birds

Dead birds have been found in nearby areas.

ATSDR Response

ATSDR cannot determine the cause of the birds' deaths. Dead birds should, however, be reported to local health officials at 1-866-487-3297 or (505) 576-8000.

Community Concern – Phosgene and False Positives

Four compounds detected by the open path FTIR, including nitric acid and phosgene, were determined to be "false positives" by NMED, yet phosgene was reported by Intel-New Mexico.

ATSDR Response

Phosgene can be formed when chlorinated hydrocarbon compounds (e.g. chloroform) are exposed to high temperatures, such as what occurs in thermal oxidizers. Intel-New Mexico reports, however, that its exhaust ventilation system is designed to prevent corrosive chlorine-containing gases from being vented to the thermal oxidizers.

Intel-New Mexico and NMED open path FTIR used different methods for analyzing their data. ATSDR did not attempt to reevaluate false positive determinations made by NMED's consultant-spectroscopists.. ATSDR is recommending that Intel-New Mexico, in partnership with New Mexico, educate the community on the process controls and safety measures that prevent the formation of phosgene during Intel-New Mexico plant operations.

Community Concern – Evacuation Plan

Corrales has no evacuation plan for residents in the event of an emergency such as a release of an extremely toxic gas.

ATSDR Comment

ATSDR did not evaluate emergency evacuation procedures in this health consultation.

Intel-New Mexico maintains an internal 24-hour per day and 7-day per week Incident Management / Hazmat Emergency Response Program, and their response programs were developed in cooperation with the Rio Rancho Fire Department (RRFD).

Community Concern – Prior Risk Assessment and Air Modeling

Only 12 of 80 chemicals were evaluated in the risk assessment. Chronic exposures were estimated exposures, while acute exposures were based on sampling data.

ATSDR Comment

Long-term exposures (chronic) are often estimated using modeling because of the expense of monitoring to characterize long term long-term exposures to outdoor air contaminants. ATSDR uses public health assessment procedures that are similar but not identical to risk assessment. ATSDR's Public Health Assessment Guidance manual can be found at: http://www.atsdr.cdc.gov/HAC/phamanual/

Community Concern – Air Modeling

Professor Darko Koracin's modeling study indicates that Intel-New Mexico's emissions impact the local neighborhood.

ATSDR Response

ATSDR reviewed the modeling study mentioned in this comment. This particular study is part of the broader Corrales Air Quality Study that was funded by U.S. EPA and NMED. Refer to the "Community Concerns" section of this health consultation for a brief summary of the Corrales Air Quality Study.

Community Concern – Health Comparison Values

Monitoring results should be compared to Texas' Effects Screening Levels (ESLs) rather than the Acute Exposure Guideline Levels (AEGLs).

ATSDR Response

ATSDR included the odor-based Texas Effect Screening levels for comparison purposes. These particular screening levels must be distinguished from health-based effects that are used to derive ATSDR Minimal Risk Levels and U.S. EPA Reference Concentrations. In its public health determinations ATSDR uses data than and in addition to odor-based comparison values.

Community Concern – Vehicle Emissions

The plotted concentration versus time plots show that Intel-New Mexico is the major source of air pollution and not vehicle emissions (which Intel-New Mexico claims are the source).

ATSDR Response

On a regional basis, motor vehicles are the largest source of certain air pollutants (e.g., carbon monoxide) in the Albuquerque, New Mexico area (NMED 2003). For carbon monoxide, measured with the open path FTIR, concentration versus time plots coincide with morning and evening rush hours.

For the period of 1997 through 2006, NMED's monitoring station at 4330 Meadowlark Road in Rio Rancho recorded a 2nd highest maximum 8-hour average concentration of carbon monoxide at 2 parts per million, well below the U.S. EPA National Ambient Air Quality Standard of 9.0 parts per million (USEPA 2008b).

Community Concern - Emission Controls and Redundancy

Intel-New Mexico should install back-up thermal oxidizers to its plant. Semiconductor manufacturing plants in Taiwan are required to have redundant thermal oxidizers.

ATSDR Comment

We encourage Intel-New Mexico to reduce emissions to the extent feasible. ATSDR cannot, however, require Intel-New Mexico to install additional thermal oxidizers. Intel-New Mexico has replaced its original Durr thermal oxidizers with new equipment (i.e., Munters) with ductwork capable of providing redundancy.

Community Concern – Open Path FTIR Monitoring

NMED set an artificial timeline for collected open path FTIR data. Intel-New Mexico and state open path monitoring was performed during a period of lower production. The topology funnels air emission into the community during stable atmospheric conditions. One person stated that modeling should have been performed before FTIR monitoring.

ATSDR Response

ATSDR did not evaluate the decisions that determined the actual timeline for open path FTIR monitoring, locations of the monitoring equipment, or the sequence of monitoring and air modeling. Meteorological data do indicate that wind blows from the northwest down the valley during the evenings.

Community Concern - Air Emissions

The community is requesting that NMED reopen Intel-New Mexico’s air permit. Intel-New Mexico is legally allowed to release 12 months of pollutants in a one month period. Some community members urge that Intel-New Mexico’s air permit be based on fixed short term limits.

ATSDR Response

ATSDR does not issue or enforce air pollution regulations. We encourage community members to continue to participate in the air permit process. Issues pertaining to the air permit should be directed to NMED and U.S. EPA Region 6.

Community Concern – Air Pollution Controls

Acid scrubbers are inefficient and the emission factors set by Intel-New Mexico are not validated.

ATSDR Response

The scrubber efficiency and associated emission factors are incorporated into Intel-New Mexico’s air permit. However, ATSDR typically does not address such issues or enforce air pollution regulations. The environmental monitoring that ATSDR is recommending will measure actual levels of air pollution, regardless of what control efficiencies the scrubbers achieve and what emission factors Intel-New Mexico uses in its inventories.

Community Concern – Worker Safety

Some former Intel-New Mexico workers have expressed concern about exposure to hazardous chemicals in the workplace and adherence to workplace safety procedures.

ATSDR Response

Current Intel-New Mexico workers who have workplace safety and health concerns should contact plant management or Intel-New Mexico’s Environmental Health and Safety Office. If they feel their concerns are not adequately resolved, they can contact the New Mexico Occupational Safety and Health Department at the following address:

New Mexico Occupational Health and Safety Bureau, 525 Camino de los Marquez St., Suite 3, P.O. Box 26110, Santa Fe, NM 87502 Attention: Bob Genoway, Program Manager: Phone Nos.: (505) 476-8700 or (877) 610-6742.

Community Concern – MTBE

One community member indicated she had high levels of methyl tertiary butyl ether (MTBE) measured in a sample of her blood.

ATSDR Comment

MTBE is a chemical that is added to gasoline to increase the octane rating and help prevent engine knocking. Intel-New Mexico reports that it does not use or emit MTBE (Intel 2008). Common activities that lead to community MTBE exposure include fueling gasoline-powered motor vehicles and driving motor vehicles (Lioy et al 1994). There is no published reference range for MTBE in blood to use as a comparison (Terry, Ryan, and Leffingwell, 1999). The majority of MTBE and its metabolites (i.e., breakdown products) are eliminated from the blood within hours of exposure (Lee, Mohr and Weisel 2001).

Appendix B. ATSDR Evaluation Methodology

The Agency for Toxic Substances and Disease Registry (ATSDR) addresses the question of if exposure to contaminants at the maximum concentrations detected would result in adverse health effects. While the relative toxicity of a chemical is important, the human body's response to a chemical exposure is determined by several additional factors, among which are:

- The concentration (how much) of the chemical to which the person was exposed
- The amount of time the person was exposed (how long), and
- The way the person was exposed (through breathing, eating, drinking, or direct contact with something containing the chemical).

Lifestyle factors (e.g., occupation, and personal habits) have a major affect on the likelihood, magnitude, and duration of exposure. Individual characteristics such as age, sex, nutritional status, overall health, and genetic constitution affect how a human body absorbs, distributes, metabolizes, and eliminates a contaminant. A unique combination of all these factors will determine the individual's physiologic response to a chemical contaminant and any adverse health effects the individual may suffer as a result of the chemical exposure.

ATSDR evaluates contaminants detected in environmental media at a site and determines if an exposure to them has public health significance. ATSDR begins this evaluation by gathering reports that contain relevant environmental data for the site. These data are reviewed to determine if contaminant levels are above health-based comparison values. Health-based comparison values are estimates of the daily human exposure to a substance that are not likely to result in adverse health effects over a specified duration of exposure. These values are developed for specific media (such as air and water) and for specific durations of exposure (such as acute and chronic).

Comparison values represent conservative levels of safety and not thresholds of toxicity. Thus, although concentrations at or below a comparison value may reasonably be considered safe, concentrations above a comparison value will not necessarily be harmful. Comparison values are intentionally designed to be much lower, usually by orders of magnitude, than the corresponding no-effect levels (or lowest-effect levels) determined in laboratory studies to ensure that even the most sensitive populations (such as children or the elderly) are protected.

To determine if people are being exposed to contaminants or if they were exposed in the past or will be exposed in the future, ATSDR examines the path between a contaminant and a person or group of people who could be exposed. Completed exposure pathways have five required elements. ATSDR evaluates each possible pathway at a site to determine if all five factors exist and people are being exposed, were exposed, or may be exposed in the future. These five factors or elements must exist for a person to be exposed to a contaminant:

(1) A source of contamination

(2) Transport through an environmental medium

(3) A point of exposure

(4) A route of human exposure, and

(5) An exposed population.

ATSDR classifies exposure pathways in one of the following three categories.

- *Completed Exposure Pathway*. ATSDR calls a pathway "complete" if it is certain that people are exposed (or were exposed or will be exposed) to contaminated media. Completed pathways require that the five elements exist and indicate that exposure to the contaminant has occurred, is occurring, or will occur.
- *Potential Exposure Pathway.* Potential pathways are those in which at least one of the five elements is missing, but could exist. Potential pathways indicate that exposure to a contaminant could have occurred, could be occurring, or could occur in the future.
- *Eliminated Exposure Pathway*. In an eliminated exposure pathway, at least one of the five elements is missing and will never be present. From a human health perspective, pathways can be eliminated from further consideration if ATSDR is able to show that (1) an environmental medium is not contaminated or that (2) no one is exposed to contaminated media.

Appendix C. Health-Based Comparison Values

ATSDR's approach to evaluating a potential health concern has two components. The first component involves a screening process that could indicate the need for further analysis of selected contaminants. The second component involves a weight-of-evidence approach that integrates the estimate of likely exposure with information about the toxicology and epidemiology of the substances of interest.

Screening is a process of comparing appropriate environmental concentrations and doses to comparison values. These comparison values (CVs) include but are not limited to

- ATSDR's Minimum Risk Levels (MRLs),
- ATSDR's Cancer Risk Evaluation Guidelines (CREGs),
- EPA's Maximum Contaminant Levels (MCLs),
- EPA's Risk-Based Concentrations (RBCs), and
- EPA's Preliminary Remediation Goals (PRGs).

When determining which environmental guideline value to use, ATSDR staff followed the agency's general hierarchy and used professional judgment to select those CVs that best apply to the site conditions [ATSDR 2005]. For example, some of the CVs and health guidelines used by ATSDR scientists include CREGs, and MRLs. If an ATSDR CV is not available for a particular chemical, ATSDR sometimes screens environmental data with CVs developed by other sources, including EPA's RfDs and EPA's Region III RBCs. These CVs and health guidelines, as well as all other health-based screening criteria, represent conservatively derived levels for screening and assessing the likelihood of adverse effects; they are not thresholds of toxicity. Although concentrations at or below a CV may be considered safe, concentrations above a CV will not necessarily be harmful. To ensure that they will protect even the most sensitive populations (such as children or the elderly), CVs are intentionally designed to be much lower, usually by two or three orders of magnitude, than the corresponding no-observed-adverse-effect-levels (NOAELs) or lowest-observed-adverse-effect-levels (LOAELs) on which the CVs were based. When a level is above a comparison value, it does not mean that health effects could be expected—it does, however, represent a point at which further evaluation is warranted.

After identifying potential chemicals of concern through the screening process, ATSDR evaluates a number of parameters depending on the contaminant and site-specific exposure conditions. Such parameters can include biological plausibility, mechanisms of action, cumulative interactions, health outcome data, strength of epidemiological and animal studies, and toxicological and pharmacological characteristics.

In this health consultation**, ATSDR** also considered **Texas Effects Screening Levels (ESLs)** established by the Texas Commission on Environmental Quality to evaluate the potential effects from exposure to airborne contaminants. ESLs are based on data concerning health effects, the potential for odors to be a nuisance, effects on vegetation, and corrosive effects. Similar to other screening values, when levels of air contaminants exceed the ESLs, further evaluation is necessary prior to determining if a public health hazard may be present (TXEQ 2008).

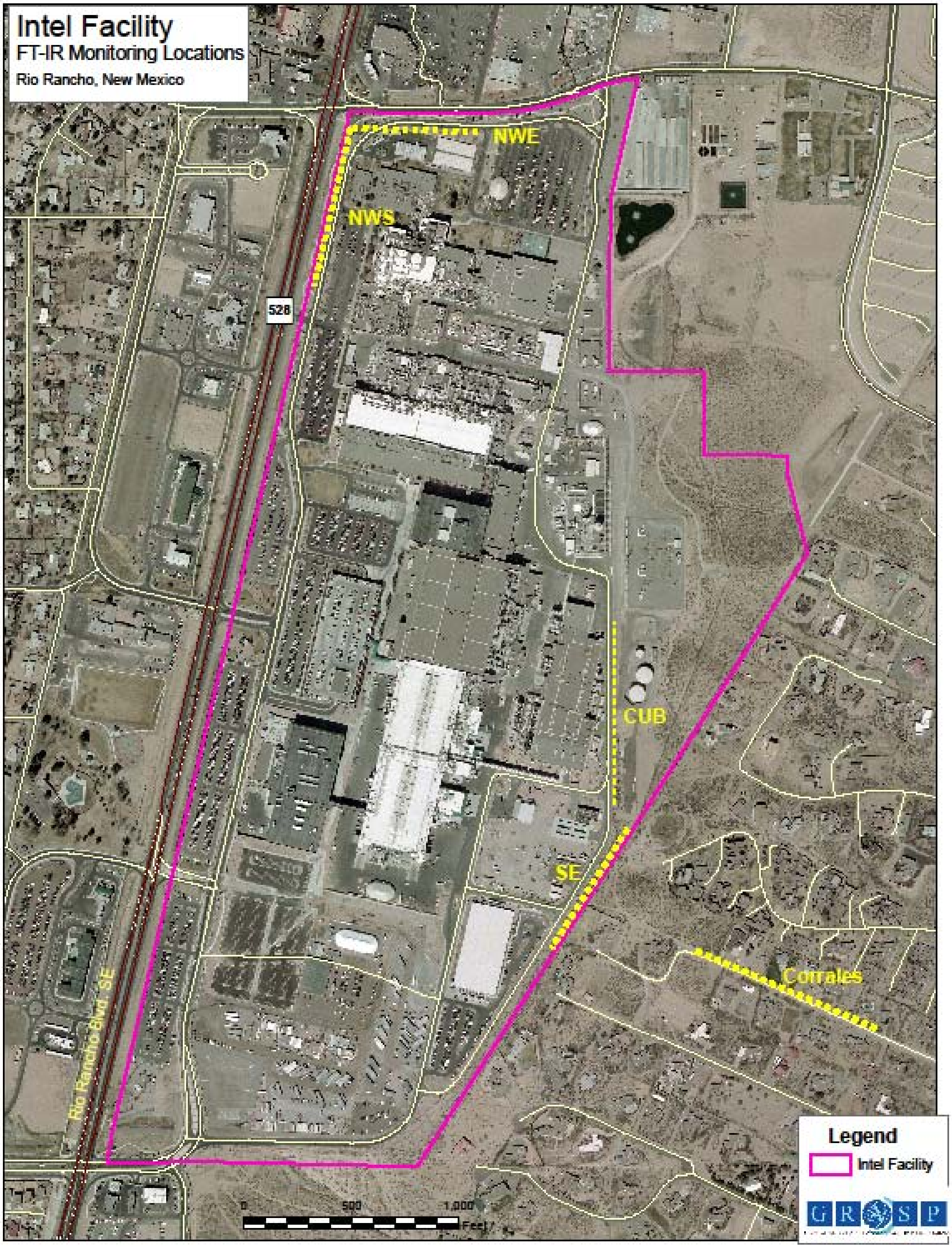
Appendix D. Background information on Open Path FTIRs

The open path FTIR method identifies the presence of numerous gaseous chemicals in air simultaneously, and can measure chemicals at concentrations down to parts per billion. Open path FTIRs measure the average concentration of a chemical in the air over set distances between the sending optics and the detectors. These devices are particularly useful for measuring emissions from area sources such as lagoons or large buildings with fugitive emissions over periods of time.

Open path FTIRs include an infrared light source, interferometer, sending optics, absorbing medium (outdoor ambient air, in this case), receiving optics, and a detector. At the source, a beam of infrared light is passed through the interferometer, which splits the light beam into a transformed signal as a function of optical path difference (i.e., the interferogram). This encoded light beam passes from the sending optics across the area to be monitored (the absorbing medium, or outdoor ambient air in this case) to receiving optics and onto a recording detector. The signal output is changed using a mathematical method (Fourier transformation) to produce a spectrum that can identify air contaminants and their concentrations. FTIR data analysis relies on Beer's Law, which holds that the intensity of the direct light energy traversing an absorbing medium (in this case air) diminishes exponentially with concentration (USEPA 1996). The disadvantages of this method include: 1) expense of the equipment, 2) it requires highly skilled operators to set-up and operate the equipment and to analyze the data, and 3) changes in atmospheric conditions can affect the sensitivity of the instruments (ability to detect and measure low levels of air contaminants.)

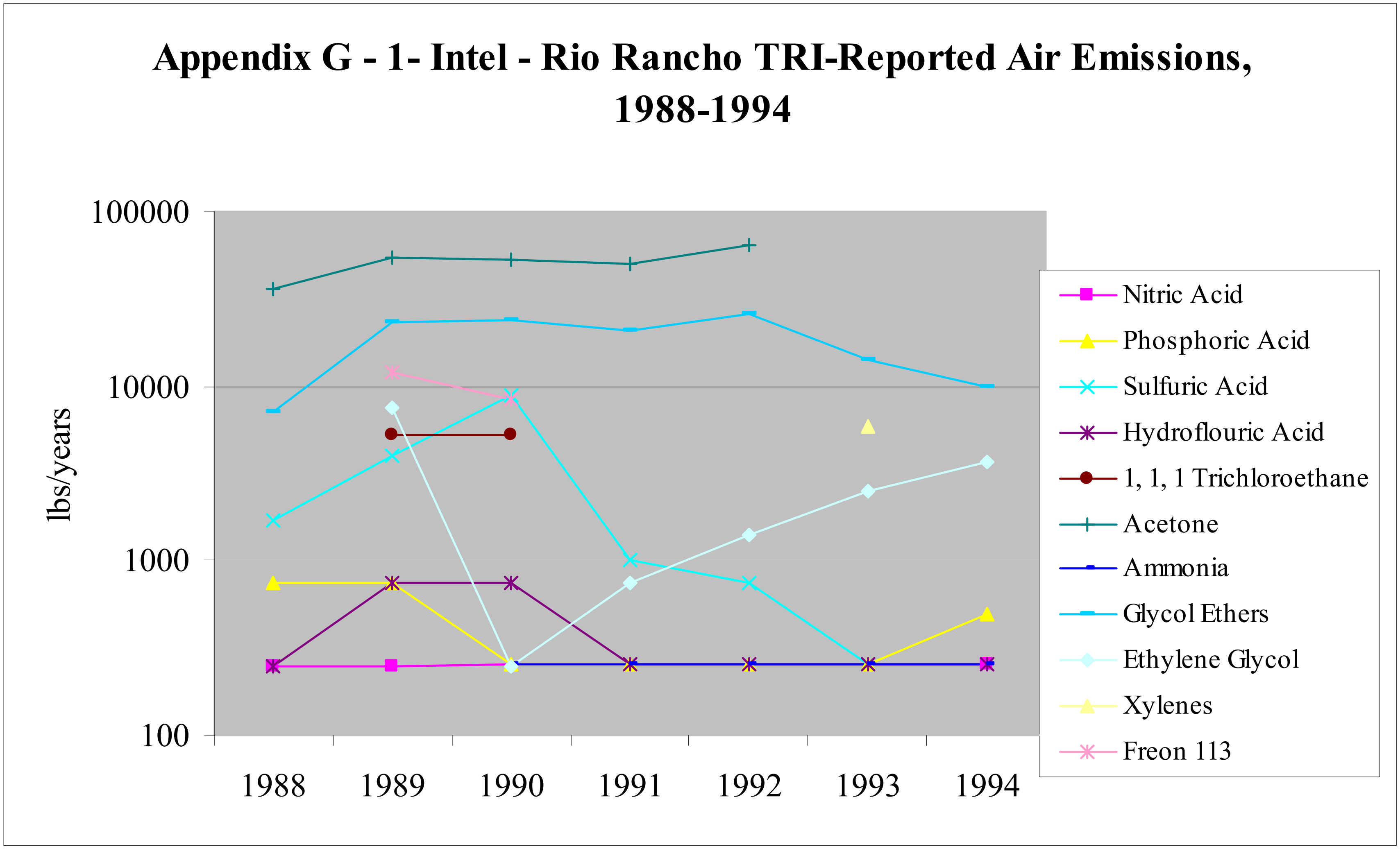
Because of limitations inherent in the open path FTIR applications, very few environmental sampling investigations have relied solely on open path FTIR for a comprehensive evaluation of hazardous air pollutants. Open path FTIR primarily has been used for: 1) methods research development, 2) measuring emissions flux of select compounds from large area sources (e.g., ammonia from waste lagoons), 3) measuring carbon monoxide emissions from commercial airports, and 4) measuring parts per million levels of air contamination in the workplace.

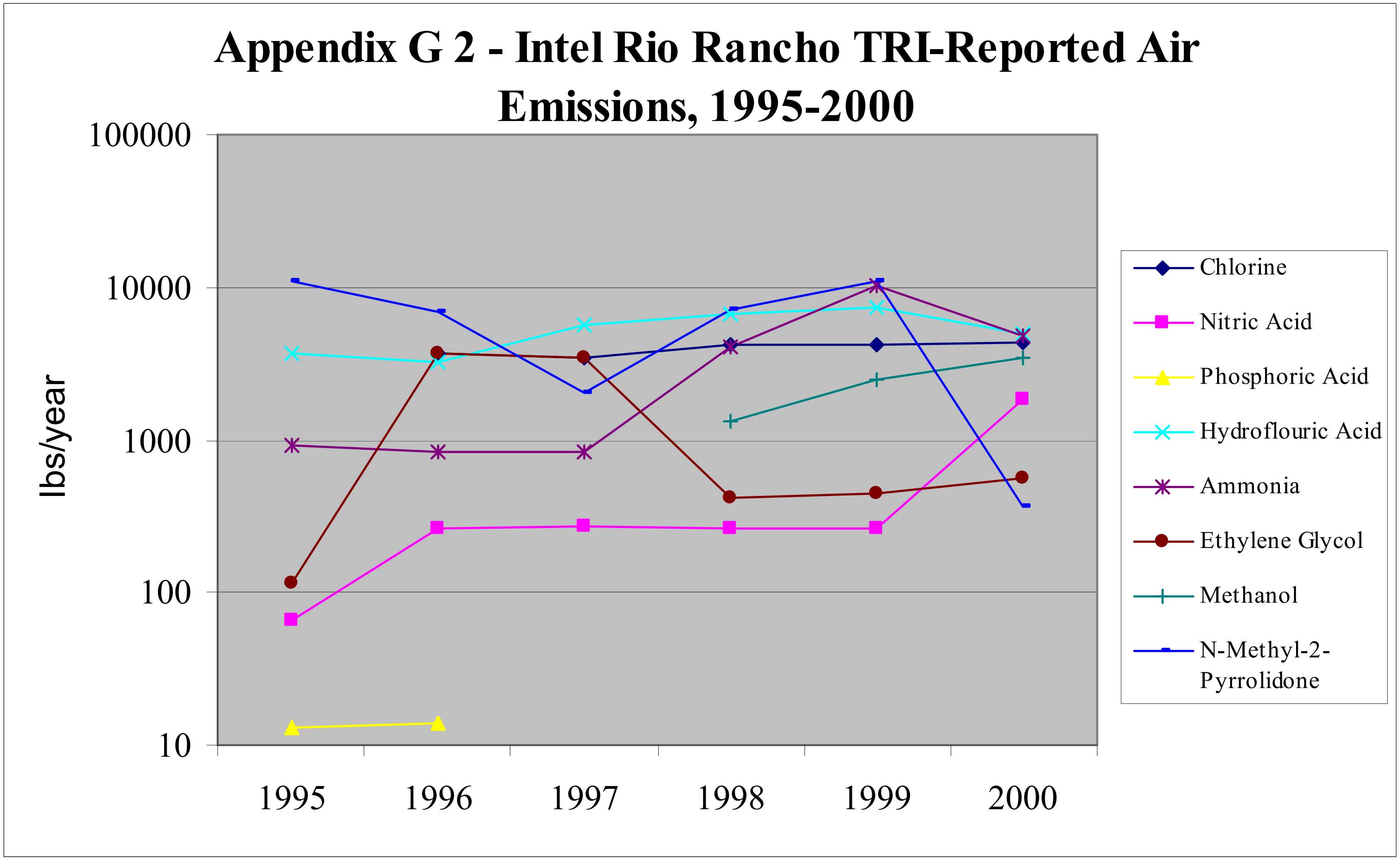
Appendix E. Intel-New Mexico Open Path FTIR Monitoring Locations

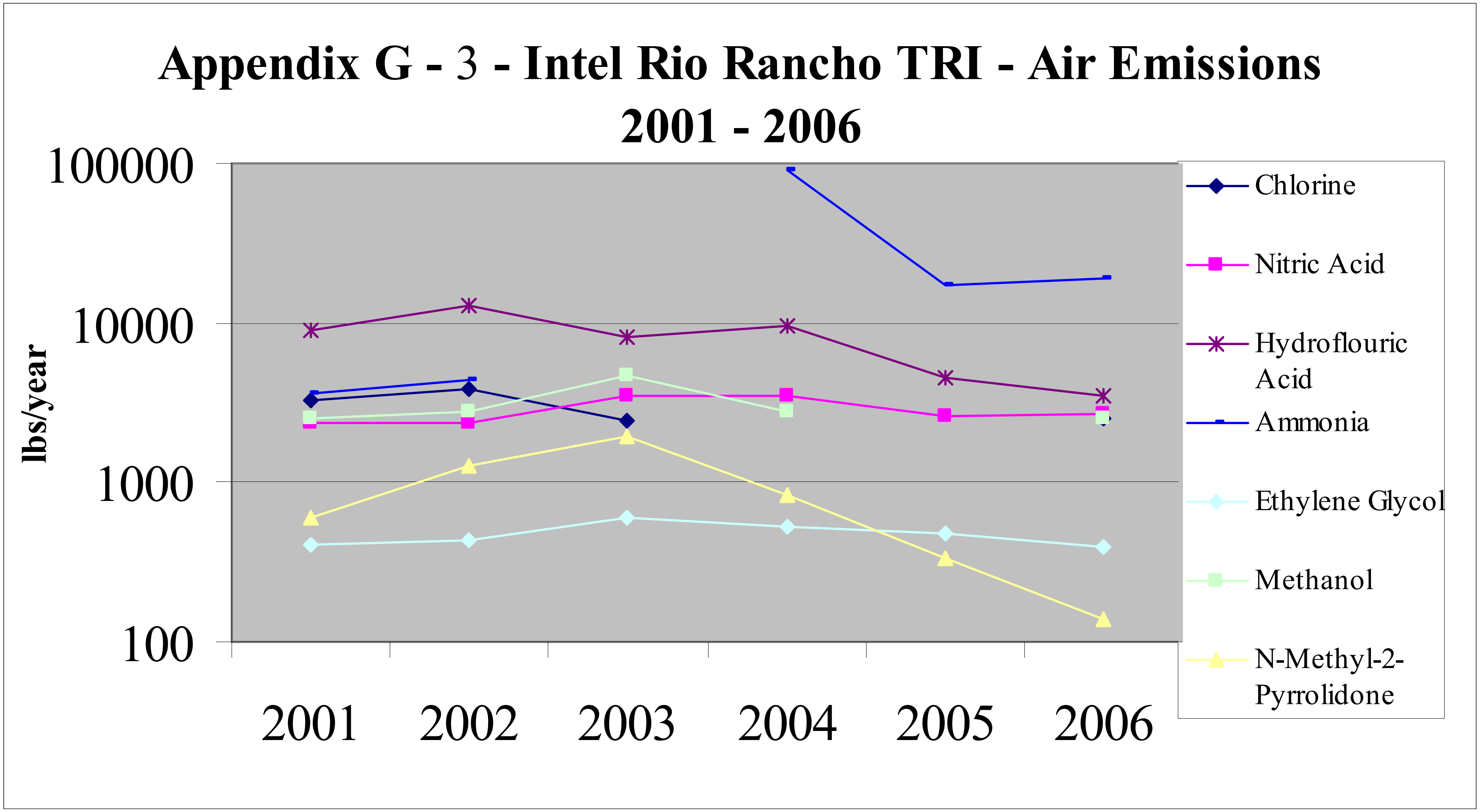

Intel Facility
FT-IR Monitoring Locations
Rio Rancho, New Mexico
NWE
NWS
528
CUB
SE
Corrales
Rio Rancho Blvd SE
Legend
Intel Facility
0
500
1,000
Feet
GRASP

Appendix F. Carbon Monoxide Figures

Appendix G. Toxic Release Inventory Figures


Appendix G - 1- Intel - Rio Rancho TRI-Reported Air Emissions, 1988-1994
lbs/years
100000
10000
1000
100
1988
1989
1990
1991
1992
1993
1994
Nitric Acid
Phosphoric Acid
Sulfuric Acid
Hydroflouric Acid
1, 1, 1 Trichloroethane
Acetone
Ammonia
Glycol Ethers
Ethylene Glycol
Xylenes
Freon 113


Appendix G 2 - Intel Rio Rancho TRI-Reported Air Emissions, 1995-2000
100000
10000
1000
100
10
lbs/year
1995
1996
1997
1998
1999
2000
Chlorine
Nitric Acid
Phosphoric Acid
Hydroflouric Acid
Ammonia
Ethylene Glycol
Methanol
N-Methyl-2-Pyrrolidone


Appendix G - 3 - Intel Rio Rancho TRI - Air Emissions
2001 - 2006
100000
10000
1000
100
lbs/year
2001
2002
2003
2004
2005
2006
Chlorine
Nitric Acid
Hydroflouric Acid
Ammonia
Ethylene Glycol
Methanol
N-Methyl-2-Pyrrolidone

Appendix H. ATSDR's Categories of Public Health Hazard

CATEGORY A: URGENT PUBLIC HEALTH HAZARD

This category is used for sites where short-term exposures (<1 year) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.

This determination represents a professional judgment based on critical data that ATSDR has judged sufficient to support a decision. Such a designation does not necessarily meant that the available data are complete; in some cases, additional data may be required to confirm or further support the decision made.

Criteria:

Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices, which, if ruptured, could release radioactive materials.

CATEGORY B: PUBLIC HEALTH HAZARD

This category is used for sites that pose a public health hazard because of the existence of long-term exposure (>1 year) to hazardous substances or conditions that could result in adverse health effects.

This determination represents a professional judgment based on critical data that ATSDR has judged sufficient to support a decision. Such a designation does not necessarily mean that the available data are complete; in some cases, additional data may be required to confirm or further support the decision made.

Criteria:

Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical hazards, such as open mine shafts, poorly stored or maintained flammable/explosive substances, or medical devices, which, if ruptured, could release radioactive materials.

CATEGORY C: INDETERMINATE PUBLIC HEALTH HAZARD

This category indicates that a professional judgment on the level of health hazard cannot be made because information critical to such decision is lacking.

Criteria:

This category is used for sites for which available critical data are insufficient with regard to the extent of exposure and/or toxicological properties at estimated exposure levels. The health assessor must determine, using professional judgment, the "criticality" of such data and the likelihood that the data can and will be obtained in a timely manner. Where some data- even limited data- are available, health assessors should to the extent possible select other hazard categories and support their decision with a clear narrative that explains the limits of the data and the rationale for the decision.

CATEGORY D: NO APPARENT PUBLIC HEALTH HAZARD

This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.

This determination represents a professional judgment based on critical data that ATSDR has judged sufficient to support a decision. Such a designation does not necessarily mean that the available data are complete; in some cases, additional data may be required to confirm or further support the decision made.

Criteria:

Available relevant information indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in adverse impact on human health.

CATEGORY E: NO PUBLIC HEALTH HAZARD

This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.

Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are occurring, and none are likely to occur in the future.

* *Examples include environmental, demographic, health outcome, exposure, toxicological, medical, or epidemiologic data, as well as community health concerns information.*

Appendix I. Intel-New Mexico Pollution Roses

ACKNOWLEDGMENT OF RECEIPT

Agency for Toxic Substances and Disease Registry
ATTN: Records Center
1600 Clifton Road, NE, Mail Stop F-09
Atlanta, GA 30333

RE: INTEL CORPORATION – NEW MEXICO FACILITY
RIO RANCHO, SANDOVAL COUNTY, NEW MEXICO
EPA FACILITY ID: NMD000609339
Release Date: February 2, 2009
Comment Period Ends: April 3, 2009

____ I have received the copies of the Health Consultations - Public Comment and will place them in the repository for the site as requested.

____ I have not received the copies of the Health Consultations - Public Comment as indicated in my letter, but am interested in doing so.

____
Signature

____
Date

Mailing address:

Attention: Reference Librarian
Corrales Community Library
84 West La Entrada Road
Corrales, NM 87048

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Agency for Toxic Substances and Disease Registry
ATTN: Records Center
1600 Clifton Road, NE, Mail Stop F-09
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____
Signature

____
Date

Mailing address:

Attention: Reference Librarian
Rio Rancho Library
950 Pinetree Road, SE
Rio Rancho, NM 87124